The
Animals of Australia

Mammals, Reptiles, and Amphibians

LUCAS AND Le SOUEF

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from his officer & father

Thursby Dawnay

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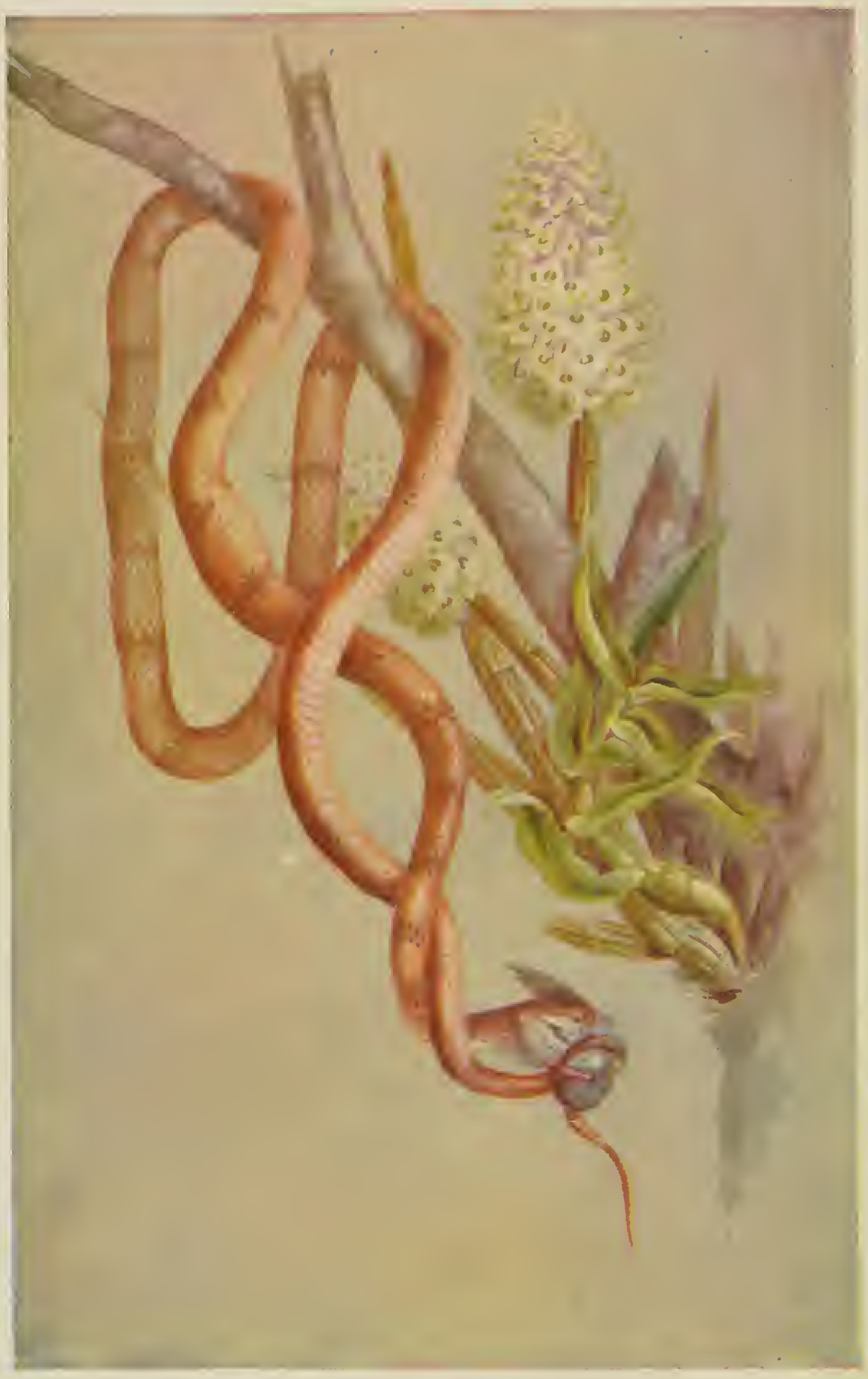

From life. *Mrs. Ellis Rowan.*

Brown Tree Snake, Mackay, Queensland.

79637

The Animals of Australia.

MAMMALS, REPTILES AND AMPHIBIANS.

BY

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PREFACE.

This book is designed as a companion volume to "The Animals of New Zealand" of the same publishers. The object of this work, as of that, is to combine popular information with that which is purely scientific. We have endeavoured both to serve the needs of the naturalist and to provide matter of interest for the general reader.

The plan adopted is to give accurate descriptions and illustrations of the animals, so that they may be identified with precision and with as little difficulty as possible, and to add as much popular information as is available and trustworthy concerning their habits and surroundings.

Naturally, the Fauna of a Continent is more difficult to delineate than the Fauna of a limited Island Group. The animals are much more numerous, have more complicated relationships, and a more varied origin. It was impossible to compress a reasonable account of all the Air-breathing Vertebrates of Australia into one volume. Hence it has been thought best to include in the present book only the quadrupeds and their allies, the Mammals, Reptiles and Amphibians, and to reserve the Birds for another volume, which is already in an advanced stage of preparation. No such general account of the Quadrupeds has been published before.

In order to make the book as complete as possible, while advantage has been taken of personal knowledge, we have drawn largely on other publications on Australian animals. We have gladly to acknowledge our deep indebtedness to the magnificent series of Descriptive Catalogues published by the authorities of the British Museum. These are monuments of scientific industry and erudition of which the nation may well be proud. We have in all instances followed the classification adopted in the Catalogues. We are under obligation to Ogilby's "Australian Mammals," published by the trustees of the Australian Museum, and to the Records of the Museum; to Professor McCoy's "Prodromus of the Zoology of Victoria," published by the Victorian Government; to the works on Snakes by Krefft and by Waite; various papers in the Proceedings of the Linnean Society of New South Wales, and the Royal Societies of the several States; to the Memoirs of the Horn and other Expeditions; and for many interesting notices of habits to the researches of the Field Naturalists' Club of Victoria, recorded in the Victorian *Naturalist*. Other works have been consulted, and are alluded to in the text.

The illustrations have been collected with a considerable amount of labour, and have been derived from a variety of sources. By the generous permission of the Trustees and the Curator, a large series of photographs has been secured of the animals in the Australian Museum, and our thanks are due to them and to the officers and assistants for the ready facilities afforded for the purpose. A few others were obtained of animals in the collections of the Macleay Museum and the Sydney Technological Museum. We have also to thank the Trustees of the British Museum and the Government of Victoria, for permission to copy illustrations from some of the British Museum Catalogues, and the Prodromus of the Zoology of Victoria. As many as possible of the figures are from life. For some of these we have to thank Messrs. C. Frost, A. E. H. Mattingley, A. R. McCulloch, J. B. Lane, A. J. Hamilton, and Professor J. P. Hill. Where no acknowledgment is made it will be understood that the photographs were taken by the authors.

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The Animals of Australia.

INTRODUCTION.

Australia is the great Island Continent. During the periods of time called by the geologists Recent, Pleistocene and late Tertiary, portions of it have been separated as the islands which appear around its coasts. The general Fauna and Flora of Barrow Island, Houtman's Abrolhos, Kangaroo Island, Tasmania, is distinctly Australian, but separation has continued long enough for special species of plants and animals to develop. Barrow Island has still its peculiar kangaroo (*M. isabellinus*), Kangaroo Island had its peculiar Emu, and Tasmania its peculiar carnivorous Marsupials and its distinct race of man. Travelling back geologically we find Australia connected by a land bridge to New Guinea. Still further back there would seem to have been a land connection with Timor. Along both of these routes land forms have made their way into Australia. In perhaps Cretaceous times there seems to have existed a long peninsula running from New Guinea and land to the east of it away down to New Zealand. Traces of this round about and long dissolved union can still be read in certain common features of the faunas and floras of New Zealand and Australia, features not present in those of South Africa or South America. Before this again a dim vision arises of a great Antarctic Continent or Archipelago in which there were connections, probably not all at one time, between the southern extremities of Africa, Asia as represented by Australia and New Zealand, and America.

And while the relations of Australia to the rest of the world have been undergoing these great changes, the continent itself has by no means maintained its continuity. Tertiary and

Cretaceous seas separated the East from the West, and in consequence these have worked out their destinies to a considerable extent apart. South-West Australia has suffered more complete isolation than the other Australian Regions, for the barriers of the seas were succeeded by the barriers of the great Deserts.

The existing animals of Australia are the descendants, often modified almost out of recognition, of the animals of these past times. A Mesozoic stock has been isolated in the main for long geologic periods of time. The originals of our present Amphibia and of our Lizards, and primitive Mammalia comprise all that we can recognize of our Triassic pioneers. Strangely enough, however, it would appear that the genera *Myrmecobius* and *Ceratodus* have persisted unaltered to the present.

The most ancient and most primitive section of the Mammals of all the world, the egg-laying Monotremes, has survived, and most likely originated in Australasia. The Platypus is confined to an Eastern strip from South Queensland to Tasmania. The Spiny Ant-eaters (Hedgehogs or Porcupines of the vernacular) have a wide range. They are found in Tasmania and all over Australia, while a rather different form occurs in New Guinea. Both have become highly specialised for very definite and peculiar modes of life, and hence they are in external appearance as unlike as possible, and must be strikingly different from the group of Reptiles from which they sprung.

The Marsupials, which form the bulk of the native Mammals of Australia, have had an exceedingly interesting history. Fossil remains of small forms, which may be looked upon as primitive mammals from which both the present Marsupials and the other existing mammals of the world have originated, have been found in the Triassic rocks of Europe and North America, while others more distinctly mammalian occur in Jurassic beds. However evolved from these small and simple Mesozoic forms and others the remains of which have not been discovered, the Marsupial section was unable to hold its own in the Old World, and has survived only in America as far north as the Southern United States, where the carnivorous Opossums are met with, and in Tasmania, Australia and Papua. A fortunate isolation enabled them to develop on their own lines in Australia. With less highly convoluted brains, they have nevertheless differentiated to nearly the same extent as the Eu-Theria, and have occupied stations in life similar to those occupied by the different orders of the Eu-Theria in other parts of the world. The Kangaroos and Wallabies take the place of the Deer and Antelopes on the plains and in the forests; the Opossums, furry like the Lemurs, Squirrels and Flying Squirrels, and the Koala, sluggish of movement like the Sloth, live among the trees; the Tasmanian Wolf and Devil are fierce carnivores; the Native Cats have similar tastes and habits to the Weasels and Martens; the Wombat burrows like the Badger; *Notoryctes* and *Myrmecobius* are Ant-eaters in a paradise of ants; there are root-grubbers and insect-feeders: in fact all stations on the ground and in it have been occupied, but no Marsupial has learnt to fly in the air like the Bats or to swim in the water like the Otter or Beaver.

Larger forms immediately preceded the existing animals. "Among extinct marsupials we have *Diprotodon,* as large as a rhinoceros, but as inoffensive apparently as a Wombat, which it seems to have resembled much in appearance. *Thylacoleo,* a huge carnivorous monster, greater than a polar bear, was allied to the phalangers. There were also giant kangaroos, standing a dozen feet high, and wombats as large as an ox. On the other hand there was a dwarf wombat, about a quarter of the size of our recent species. The oldest known Australian marsupial, *Wynyardia,* is of Oligocene or perhaps Eocene age." (Hall).

The Marsupials (*Meta-Theria*) constitute a very natural group, though there is not a hard and fast definition by which they may be separated from the Eu-Theria. Thus while the young, which are born in a very immature state, are usually sheltered for a long period in the pouch of the mother, in the genera *Myrmecobius* and *Antechinomys* the pouch is practically obsolete. And while in most Marsupials there is no organic connection, or placenta, between the uterus and the embryo, a structure constantly present so far as is known in all the Eu-Theria, yet such a placenta has been found in the Native Cat, *Dasyurus.* These facts clearly point to a common ultimate origin for the Marsupials and the other Theria.

These last are by no means wanting in Australia. Certain orders have come to us by immigration. The Dugong has a wide range in the Indian Ocean and has worked round through

Torres Strait to the coast of Queensland. Whales and Seals travel far by water, and with the great Southern Ocean open to them during all Tertiary time it is not remarkable that the early settlers found them in great abundance around our shores. Fruit-eating and insectivorous Bats came across from Malaysia and South-East Asia, and though a difficult group to study, and our knowledge of them is very incomplete, enough is known to show us that they are widely distributed and well established in Australia. The Rodents probably became denizens of the Continent in later Tertiary times. They too probably came in from Asia, for we have no groups related to the peculiar genera of South America and the Cape. Our Rodents all belong to the widely distributed family of the *Muridae*. The most specialised genus is *Conilurus* (*Hapalotis*), comprising graceful little Rats which take the place of the leaping Jerboas of Africa and Asia. Then came in the Dingo, a wolf from Eastern Asia. Lastly, introduced direct from Europe, came a disastrous and prolific population of the Black and the Brown Rats, the Common Mouse, the Rabbit and the Hare, and, worst of all, the Fox. During the year 1908 no fewer than 18 millions rabbit-skins passed through the Sydney market, besides probably a nearly equal number through the Melbourne markets, and vast numbers of rabbits were exported in cold storage, but these inroads produce little effect in exterminating the pest.

The Reptiles have been long in the land. The Crocodiles belong to the genus *Crocodilus* evolved in the Old World. Our two species are an advanced guard, or rather a reconnoitring party, the peculiar *C. johnstonii* having perhaps become differentiated in Australia. The Freshwater Tortoises have their nearest allies in South America. Snakes are numerous, venomous and non-venomous, in the ratio of about three to one of species. Curiously, only venomous snakes have reached Tasmania. The Pythons have an Asiatic facies. The venomous snakes are all Colubrine, and have not the deadly character of some of the Vipers. While a bite of the larger species on the bare skin may prove fatal, limbs protected with clothing are in general secure. The burrowing Blind Snakes are perfectly harmless and beautifully adapted to their underground life, and are useful to mankind because they live on the destructive white ants. Most, if not all, of our snakes have differentiated in Australia.

The lizards are of even longer standing than the Snakes. The Monitors of Africa and South Asia are represented by several species, some of which have spread over the continent, but these are perhaps among our later acquisitions. Pleistocene fossil forms have been met with. The soft-skinned Geckoes, the rough-sealed Agamidæ and the smooth-scaled Skinks constitute our dominant families. The Geckoes are a widely distributed tropical group, most numerous in the Indian and Australian regions. Certain of our isolated Australian genera have their closest allies in far distant Arabia, Madagascar and Cape Colony respectively. The Agamidæ (Dragons) are a prominent Old World Family. The Frilled Lizard is our most specialised form. Skinks are cosmopolitan and evidently a very ancient family. They are, however, poorly represented in South America, and we have no representative at all in Australia of the typical American families, the *Iguanidae* and *Teiidae*. Lastly the remarkable *Pygopodidae*, snake-like lizards with most rudimentary limbs are exclusively Australian. Clearly the origin of our Lizards goes far back, though not dating from the old Antarctica times, and many quaint and interesting forms have been evolved during their Australian isolation.

Amphibia existed in Australia in Permo-Carboniferous ages. The giant forms of Labyrinthodonts died out, however, as elsewhere and our present Frogs and Toads are of the same general structure as those existing in other parts of the world. The *Cystignathidae* and *Hylidae* are the now dominant families. Cystignathid Frogs exist also in America. The *Hylidae* or Tree Frogs have a wide tropical and subtropical range. A few curious genera of Toads, *Bufonidae,* with limited distribution seem to point in the present isolation and paucity of the species to a former greater extension of the family. A single *Rana* has crept in from Papua as a migrant in comparatively recent times. There are no tailed Amphibia in Australia: The tailless frogs have in some cases become strikingly adapted to the more or less arid conditions, and have adopted special habits of æstivation and of oviposition.

We append an approximate census of described Australian Mammals and Reptiles:—

Mammalia—Monotremes 2
Marsupials 106
Eu-Theria 106

Reptiles—Crocodiles 2
Turtles and Tortoises 12
Snakes 105
Lizards 390
Amphibia—Toads and Frogs 62.

The importance of the Australian Fur Trade, and, at the same time, the ravages which it is making in our indigenous fauna, may be seen by the numbers of furred skins offered in the Sydney market during the twelve months ending December 31st, 1908. The information has been compiled and supplied by the courtesy of Messrs. Winchcombe, Carson and Co., a leading firm of Sydney wool-brokers. The list is incomplete, inasmuch as Sydney, though the most important, is not the only centre of the trade:—

Opossum Skins ...	873,837	Phalangers
Whiptail Kangaroos ...	9,275	Macropus Parryi
Native Bears ...	57,933	Phas-colarctus cinereus
Grey Kangaroo ...	40,023	Macropus giganteus
Wallaroo ...	27,620	,, robustus
Red Kangaroo ...	31,547	,, rufus
Scrub Wallaby ...	352,412	,, ualabatus, ruficollis, &c.
Swamp Wallaby ...	41,265	,, thetidis
Rock Wallaby ...	92,590	Petrogale

The pelts of the Marsupials are likely to become increasingly valuable as the world's stock of fur-bearing animals is deplenished. The animals are, as is shown by the figures, becoming greatly reduced in numbers, and in many districts are already practically exterminated. The Kangaroos and Wallabies are shot for sport, for their pelts, for their soup-making tails, or because they are rivals for grass of the sheep and cattle. The opossums are slaughtered by thousands for their skins, a large proportion never reaching the markets. Without efficient, not merely nominal, protection and security during the breeding season, the animals will become extinct, for with the increase of the network of railways very few parts of the country are beyond the reach of the hunters and trappers.

Is Australia prepared to lose altogether its fur-bearing Marsupials? I have inquired at times amongst practical men, and find that at present it is much more profitable on fairly good land to rear sheep and cattle than to rear Kangaroos and Wallabies. In poor country, rocky and hilly, the comparison is not so unfavourable to the latter. The feasible policy then seems to be to protect the Marsupials to such an extent as to prevent extermination on the good grounds, to give them a chance in poor country, and to set aside areas, the Government on a larger scale as in national parks and reserves, and broad-minded landowners, as some are doing, on a smaller scale, in which a stock of Marsupials may be preserved. Then, when prices are favourable, it will be at least possible to develop on a feasible scale a fur industry which may compare with the ostrich farming, which has been found so profitable in Cape Colony.

MAMMALIA.

Warm-blooded animals breathing air direct by means of lungs: skin usually covered with hair: skull jointed to the backbone by two condyles: the young fed with milk from the mother.

SUB-CLASS EUTHERIA.

Viviparous: no pouch: the mammæ provided with teats: the young born in such an advanced state that they are able to draw nourishment from the teat: no epipubic bones: adults provided with teeth.

ORDER CARNIVORA.

Terrestrial or aquatic flesh-eating quadrupeds, with sharp cutting and tearing teeth.

Sub-order Fissipedia.

Terrestrial Carnivores with a large "sectorial" or "flesh-tooth" on either side of each jaw biting with its fellow like a pair of shears: toes free.

Family Canidae.

Head elongate: nose pointed, flat and hairless, with a central groove beneath: long tearing canine teeth: feet prolonged, toes straight with blunt claws; toes of the fore-limb five, the inner not reaching the ground, of the hind-limb four; organs of scent, sight and hearing highly developed.

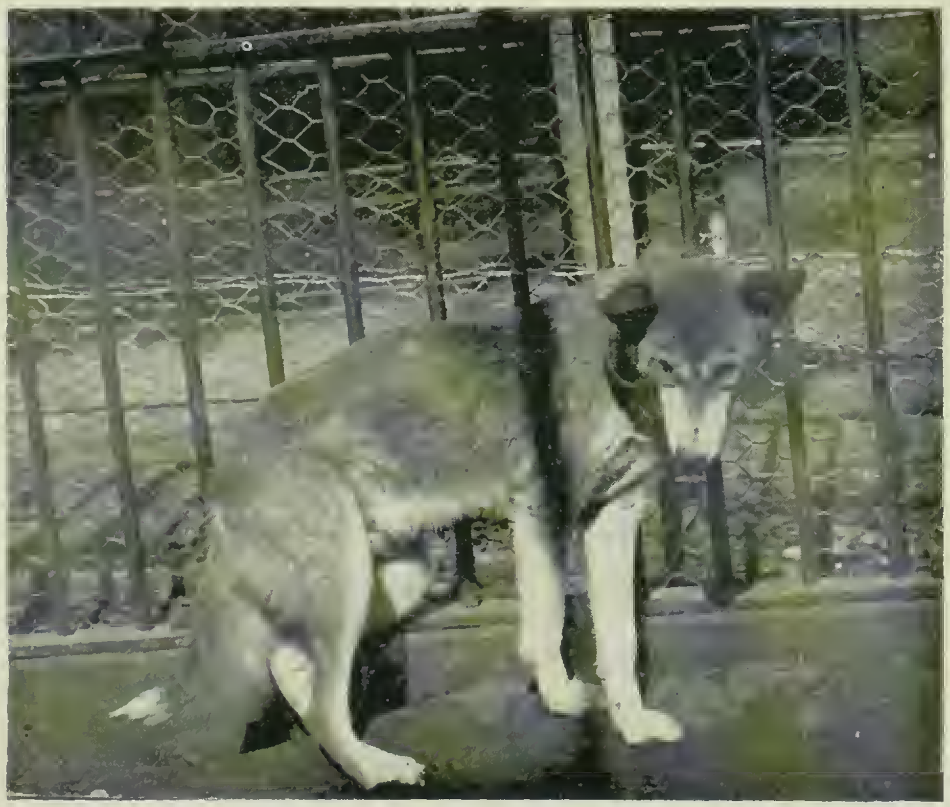
Genus Canis.

Two molars behind the sectorial tooth in the upper jaw, three in the lower.

The Warrigal, Dingo or Wild Dog.

Canis Dingo.

With an infamous reputation on the sheep runs, and detested by the selector, the Dingo is nevertheless the most highly organised, as well as one of the most ancient of the living Australian land mammals. While the other land Carnivora have become dominant over the other great continents, he alone, isolated from all his kin, is found ranging like a mediæval freebooter over the whole of Australia.



Dingo. *Melb. Zoo.*

In the anatomy of his teeth and skeleton he seems to be intermediate between the Wild Dogs of South America and the Dogs and Wolves of the Old World. He is an unmistakable Dog, and unmistakably wild. Now not often encountered near the coast in the settled districts, he is to be seen, or at night his dismal howl may be heard, anywhere in the interior, on the plateau or on the plains, in woody ravines in the mountains, or on the sandy stretches of the central desert.

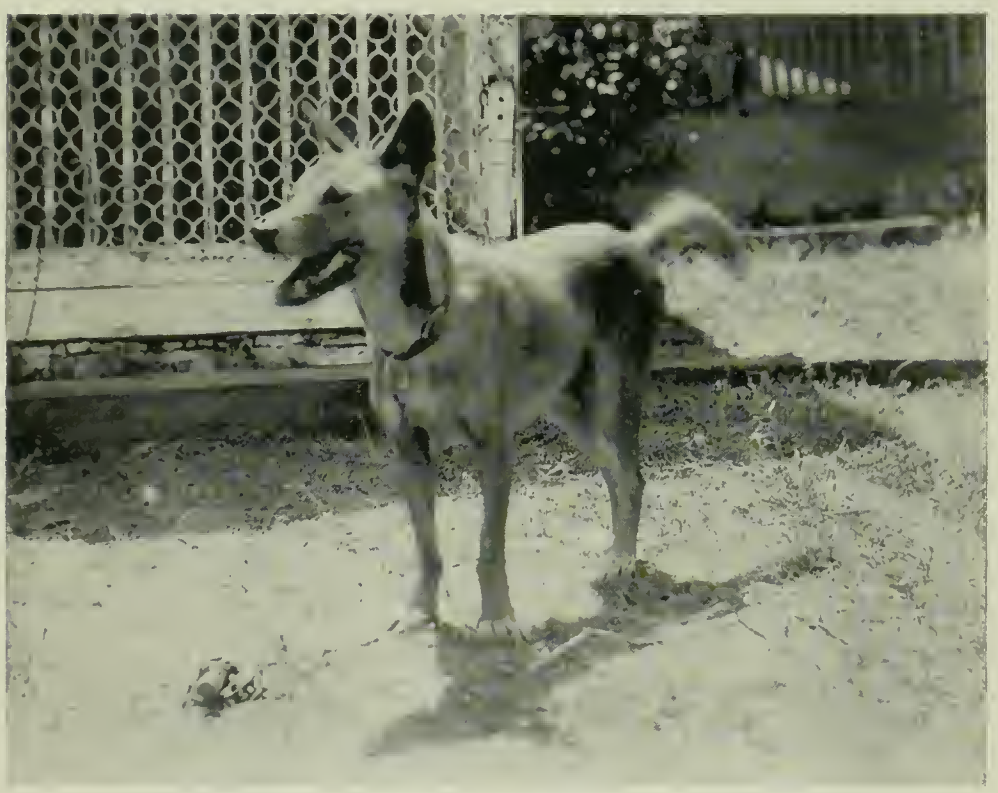
You may meet them singly, or in pairs, or more rarely in small packs of five or six. Even if you are alone, they will not attack you, but look you over calmly, and then trot off, head high in air, not deigning to take further notice. In their native haunts they are fine looking animals, those in the upland wooded districts being larger, stronger, and fiercer.

In size an average dingo equals an English sheep-dog, standing over two feet high, and measuring five feet in total length. The head is pointed like that of the Fox; the ears are short and erect; the whiskers on the muzzle are one to two inches long.

The body is well covered with hair of two kinds, a grey under-fur, and longer hairs which give the body colouring. The tail is of moderate length, bushy but hardly with the brush of the Fox. The colour varies from yellow or brownish-red to even black, the Western Dogs being darker. The under-parts and inner surfaces of the limbs are lighter, and may be whitish. The feet and the tip of the tail are often white. Albinos occur, and these frequently breed true, so that a white race might be established. Females seem always to predominate.

The Dingoes are expert hunters, living on the marsupials, and indeed any creatures they can run down or surprise. They frequently hunt ground birds, such as the grass-parrakeets, stalking them, and then springing upon them as they rise. They play havoc among the sheep which are brought into their domain. A Dingo will throw a sheep over on its back, and rip out the belly, having, according to the squatters, a special weakness for the kidney. In the same way he tears down the calves, attacking the young animal perhaps when the cow has left it in order to seek water, and has even been known to succeed in cutting out a calf from a herd of cattle. And the apparently most tamed of them cannot be trusted in a fowl-yard. The bite is that of a wolf, the jaws coming together like those of a steel trap, and a sheep seldom recovers even if bitten only once.

The Dingo can make powerful leaps, and his pace is good. Still he cannot compete with a fast horse, and the squatter not unfrequently runs him down in half an hour to an hour on a trained mount, and finishes his career with a waddy. The Dingo will run into a bush or under a log when exhausted, and allow himself to be caught or destroyed, for he can then make no further resistance. An undoubted nuisance from his depredations in sheep-country, he is destroyed by any means available, perhaps most frequently by meat bait carrying strychnine.



Dingo. *Melb. Zoo.*

The Warrigal, as he was called by the blacks, has been to an extent domesticated by them. "On Herbert River," says Lumholtz, "there are rarely more than one or two Dingoes in each tribe, and as a rule they are of pure blood. The natives find them as puppies in the hollow trunks of trees, and rear them with greater care than they bestow on their own children. The Dingo is an important member of the family; it sleeps in the huts and gets plenty to eat, not only of meat, but also of fruit. Its master never strikes, but merely threatens it. He caresses it like a child, and kisses it on the mouth. Though the Dingo is treated so well it often runs away, especially in the pairing season, and at such times it never returns. Thus it never becomes perfectly domesticated, still is very useful to the natives, for it has a keen scent and traces every kind of game; it never barks, and hunts less wildly than our dogs, but very rapidly, frequently capturing the game on the run. The Dingo will follow nobody else but its owner." In this part of North Queensland, the Dingo is used in hunting the Cassowary. Other travellers give a similar account. When these half-tamed animals come into contact with the white man's dogs, there are free fights, but they also freely interbreed. In fact it is now a difficult thing to obtain a pure Dingo in Australia.

How did the Dingo come to be in Australia? One must first answer another question. How long has he been here? Fortunately, with regard to this we have definite information. The earliest explorers found them here. Some of Dampier's men saw in the North-West "two or three beasts like hungry wolves, and lean like so many skeletons." But there is evidence which takes the Dingo back to times before the aboriginal, as well as before the white man, set foot in Australia. The bones of the animal have been met with in a fossil state in several localities in Victoria in what Sir Fred. McCoy considered to be Pliocene deposits, and associated with the bones of the extinct *Thylacoleo*, *Diprotodon* and *Nototherium*. And similar remains with similar associates were found in the caves of the Wellington Valley, New South Wales. "In a well-section at Tower Hill in Victoria," says Brough Smyth, "63 feet of volcanic ash was passed through, and then 60 feet of blue and yellow clay; here were found the skull and bones of the Dingo." There is no evidence that man was in existence in Pliocene times in Australia, or indeed anywhere else.

Hence we must conclude that the Dingo reached this continent without the aid of man, and by Pliocene times. He never got as far as Tasmania, where the marsupial Wolf and Devil are still extant; so that he did not come in from the South. It is probable then that he is the descendant of some Miocene or early Pliocene Dog of South-eastern Asia, who wandered into Australia when the land bridge still existed where Torres Strait is now. The destruction of that bridge severed him from his kindred, and left him free to take

Thylacoleo—Fossil Marsupial. *Austr. Mus.*

possession of the whole of the new territory. At first he had to compete with the marsupial ground carnivores, but these he soon ousted, endowed as he was with far superior strength and intelligence. Left without a rival he has apparently remained unchanged, the fossil bones and teeth differing in no respect from the recent. When man arrived individuals were perforce associated with him, but the Dingo has never become domesticated to a greater extent than the Cheetah, and retains his general dislike to mankind, his habit of silent hunting, and his love of freedom, unimpaired to the present. Considering his ancient pedigree, and his bold independence we cannot but feel a certain respect for the Dingo.

Sub-order Pinnipedia.

Aquatic Carnivores with no special flesh-tooth: legs modified into flippers, toes completely united by strong webs.

Key to the Families.

With external ears.	Otariidæ.
Without external ears.	Phocidæ.

Family Otariidae.

Ears small. Hind limbs capable of being turned forwards so as to aid in terrestrial locomotion. Fore flippers with rudimentary claws. Incisors six above and four below.

This family includes the two kinds of seal which may be considered as resident in Australia, although neither is confined to our shores. In earlier days they were extremely abundant, but their numbers have been greatly reduced by the depredations of the hunters. No longer persecuted, a few may still be seen on islands and rocks which have been reserved for their accommodation. They "are gregarious and polygamous, and the males greatly exceed the females in size. During the breeding season they resort in large numbers to favourite breeding grounds, technically known to sealers as "rookeries," where they leave the water and pass some weeks on land, often at a considerable distance from the shore; at this period they rarely enter the water, and consequently do not feed; the males especially, on their return to what must be considered their natural element, are greatly emaciated."—(Ogilby).

Genus Zalophus.

Molars five in each jaw, large: muzzle narrow: sagittal crest, in very old males, forming a high thin bony plate of remarkable size. South and West Australia; Japan.

The Australian Sea Lion.

Zalophus lobatus.

Adult males up to ten feet in length, females much smaller. Fur dark or blackish-brown, that of the back of the head and neck rich deep fawn colour. Eyes black.

Gilbert, in writing to Gould over forty years ago, says: "This animal is extremely numerous on all the low islands of the Houtman's Abrolhos, particularly those having sandy beaches; but it does not confine itself to such places, being often found on the ridges of coral and madrepores, over which we found it very painful walking, but over which the seals often outran us. On many of the islands they have been so seldom (perhaps, even, never before) disturbed, that I frequently came upon several females and their young in a group under the shade of the mangroves; and so little were they alarmed, that they allowed me to approach almost within the reach of my gun, when the young would play about the old ones, and bark and growl at us in the most amusing manner; and it was only when we struck at them with clubs that they showed any disposition to attack us or defend their young. The males, however, would generally attack the men, when attempting to escape; but, generally speaking, the animal may be considered harmless, for even after being disturbed, they seldom attempt to do more than take to the water as quickly as possible."

A fossil seal, found in the Pliocene of Victoria, seems to be most likely identical with this species.

Genus Arctocephalus.

Molars six above, five below, pointed; muzzle rather pointed. Southern Seas.

The Australian Sea Bear.

Arctocephalus forsteri.

Adult males of a greyish dark-brown colour above, and of a darker rich chestnut-brown beneath; females of similar colouring, but lighter, yellowish-grey above. Occasionally quite grey varieties occur. The young, darker blackish brown, black when wet, yellowish about the muzzle, cheeks, and throat, and rusty chocolate underneath. Under-fur scanty, of a rich rusty chestnut.

The snout is shorter than in the New Zealand Sea Bears; the tip of the nose is jet black, and the stiff whiskers reach to about the ear in the bulls. The length of the males seven or eight feet, of the females about five and a half feet. These Seals were formerly abundant on the shores of Victoria and New South Wales, and on the islands of Bass Strait, and there was an extensive trade in their furs. This has long since ceased. The animal can now only be observed in a few localities, as in Western Port, and on the Seal Rocks north of Newcastle. On the latter they are often seen from passing steamers.

Professor McCoy visited the Seal Rocks, off the Nobbies, near Phillip Island, on which the seals abound in the breeding season, and has given an interesting account of what he saw himself and learnt from Trooper Ardill and an old sealer named Ross, who had had abundant opportunity of watching the daily life of the animals. He says: "The coast is so rocky, and the surf so dangerous that it is only on rare occasional days that a landing can be safely made, and on this occasion it was quite impossible to do so. On looking with a good binocular, one could soon make out that the greater number of what looked like brown, bare rounded rocks over the surface of the island were really seals. On the storm whistle being blown they all started up, and, with the precise action of a flock of crowded sheep driven by a dog, they awkwardly galloped in a confused cluster, jumping up on those in front in their hurry to get down to the sea, into which most of them plunged: a few old large males alone standing their ground, well raised up on their bent fin-like legs, with their broad breast to the foe, and head raised, threateningly showing their teeth, and erecting the hair of the neck angrily, like a short mane. After a little while, scores of the females and younger males came swimming out to our little vessel to look at us, raising their kind, intelligent, good-humoured, dog-like heads, with beautiful large, brown soft eyes, looking like large Retriever Dogs with the pleased and friendly expression they wear when approaching their masters."

"During the breeding season the roaring of the old males may be heard half a mile off, high above the thunders of the surf, and they show great courage and ferocity in defending the females and young when attacked by man. The young are very easily tamed, and one was going about the kitchen of the hotel at the time of my visit like a rather lame dog, following the housekeeper everywhere with affectionate pertinacity, and playing with a young kangaroo and some other tame animals about the house with all the fun of a kitten or young puppy. It would come when called like a dog, and obviously liked to have the head stroked with the hand."

Prodr. Zool. Vict.

Sea Bear.

Trooper Ardill writes:—"The Seals came to the rocks about 1st October. The time of bringing forth the pups is between 10th November and 10th December. They do not commence to breed until they are three years old. The cow generally brings forth one pup, sometimes two. They keep good watch, and care affectionately for their offspring. They circle round them in rough stormy weather, and keep them from any wash or sea that may come over the rocks. I have seen three pups washed off the rocks, and the cows have immediately followed and brought them on the rocks again in an astonishingly rapid manner. I have also seen them catch a pup in their mouth, and throw them 10 feet high, and never hurt them.

The male (or bull) during the pupping season will ascend the rocks and stop for one or two months without food, and is extremely attentive to the female (or cow) and pups. When the females fight and quarrel he restores order. The bull is very fat at the beginning of the season, and yields from five to ten gallons of oil, and in three weeks after will hardly yield one gallon.

Sea Bear. *Prodr. Zool. Vict.*

Their principal food is squid, but I have found the backbones of fish two feet long in them. They also occasionally eat leather-jackets, parrot fish, &c. Out of season they go to sea in the morning and return at night. When fighting they strike each other like the boar; their teeth are about 1½ inches long, and cut terribly. I have seen cuts from 1 to 10 inches in length. The usual colour is a yellowish-brown, although some have been seen that were spotted, and some a beautiful grey. They generally select flat, inaccessible rocks, or, where they are not disturbed, they select the grassy patches. The bull's voice sounds something like "cough, cough"; the noise is much heavier than any animal I know. The noise of the female is like that of a cow. The pup bleats like a lamb."

The Fur Seals were so widely distributed around South and South-east Australia and New Zealand that the industry if legitimately and judiciously fostered might have been a permanent source of wealth. Sir Joseph Banks speaks of a single cargo from the Antipodes Islands of 30,000 skins. The reckless slaughter indulged in by the ignorant greed of the earlier sealers has absolutely killed the industry, and it is very doubtful if it can ever by infinite pains be restored. At present, fortunately, the Seals are unmolested, being everywhere under State protection.

In years gone by these animals occasionally went inland up the Murray River, especially the females just before the birth of their young. They found their way into lagoons, and were called the Bunyip by the natives, who were very afraid of them.

Family Phocidae.

No external ears. Hind limbs incapable of being turned forwards, hence unfitted for progression on land. The flippers armed with strong terminal claws.

The earless Seals are monogamous, and there is no great difference in the size of the sexes. They are almost confined to the colder latitudes, and bring forth their young on the ice, only leaving the water for short periods.

Genus Ogmorhinus.

Four incisors in the lower jaw. Molars, except the first, with two roots, all with three pointed cusps, of which the middle one is longest.

The Sea Leopard.

Ogmorhinus leptonyx.

Ashy-grey above, with lighter and darker patches; sides spotted and blotched with black; greyish-white or yellowish-white underneath. Length, usually seven or eight feet, but may be as much as ten or twelve feet.

The Sea Leopard is but a visitor to our shores, and that only rarely. Its natural home is in the Southern Ice-pack. It feeds on fish, birds, especially Penguins, and brown sea-weed. It gives birth to a single young one in September, after a long gestation. It is said to be a savage animal, readily attacking man.

Sea Leopard. *Prodr. Zool. Vict.*

One of these Leopard Seals came ashore alive on Manly Beach, near Sydney, in July, 1905. It was secured by two men, but was thought to be too dangerous to keep alive, and was soon knocked on the head. Mr. Waite states that it was eleven feet in length. It could only progress painfully on the shore.

Like all the Seals, it is a most voracious feeder. When alive the mouth can be opened so wide that the jaws make an angle of nearly eighty degrees. The voice is somewhat between a grunt and a roar, and is not very strong.

Another Antarctic Earless Seal, *Lobodon carcinophaga,* the Crab-eating Seal, has been captured on two occasions in Victoria in recent years. One was taken at Portland, and the other came ashore on the St. Kilda beach, near Melbourne. The former was white with a very faint tinge of yellow, the second a beautifully glossy pure white. This measured seven feet four inches, and the body was marked by a long deep scar on each side, the evidence perhaps of combats in the far distant ice pack.

ORDER RODENTIA.

Terrestrial or rarely aquatic quadrupeds, with large chisel-shaped incisors; no canine teeth; adapted for gnawing.

Thanks to their remarkable fecundity the Rodents are now by far the most numerous, in species and individuals, of all the feral mammals, the world over. Their powers of propagation are startlingly and unpleasantly manifest in the case of the Rabbit, which has taken such possession of Australia as to threaten in many districts to extinguish the squatter, and which might, at a pinch, serve as the food-supply for the whole population. Sudden hordes of rats and mice also appear in the interior. Collecting in multitudes they migrate over great distances, are alarmingly destructive to the crops and stores of the settlers wherever these lie in their course, and are followed by pursuers, which may be nearly as troublesome as the rodents themselves. The following account from the *Sydney Daily Telegraph* of October 9th, 1905, by no means exaggerates the inconveniences of these waves of migrating Rodents:—

"Towards the close of 1904 and in the early months of the present year millions of mice swept over the western plains of Queensland and invaded the central districts of South Australia. A correspondent of the Adelaide *Advertiser*, writing from Goyder's Lagoon, states that he was warned of the approaching visit of the mice by the manager of Annandale station, one of Mr. Kidman's cattle-fattening depots, who wrote as follows:—'A wave of mice is passing here in countless numbers, heading south in your direction. Snakes are hard upon their tracks. We have already killed nine snakes about the premises, and four more have taken up their abode in the house.' In the cattle camps the mice proved an incessant worry. No matter where the pack bags were hung mice found their way into them and riddled the bags. If stoppers were carelessly left out of the canteens at night many mice would be poured into the quart pots in the morning. At the homestead they took possession of almost everything. At night the men retired to bed reluctantly, knowing that the pest would accompany them, and would race up and down inside the blankets. They would gnaw the ears of the sleepers, tug their hair, and use the nose as an obstacle over which to practice high jumping. Three hundred mice were poisoned in the kitchen at one station in a night, and within a few days the plague had been reduced to the extent of 2000. The mice, however, had their own way until a little gray visitor, which proved a skilful mouse catcher, put in an appearance. So thoroughly did he do his work that it would be difficult to find a mouse at Goyder's Lagoon at present. The little animal, which is approximately 9in. from point of the nose to the tip of the tail, stands 2½in. in height, has an extremely sharp nose, a somewhat fox-like shaped head, and large luminous black eyes. The tail is probably the most remarkable characteristic of the animal, being 4in. long. The tail for 2in. is round, and covered with gray fur, while the remaining 2in. is quite flat and jet black, resembling a feather. It was a stranger in those parts, no European spoken to having seen it before, but the elderly aborigines appear to be acquainted with it, and call it Modoc-koora. It belongs to the marsupial family, and the number of the young the female carries in her pouch varies from two to five."

Family Muridae.

Upper incisors, two. Lower incisors, compressed. Malar (cheek) bone reduced to a mere splint between the processes of the skull and the upper jaw. No cheek-pouches. Thumb rudimentary. Tail scaly, with a few scattered hairs. Cosmopolitan, the largest family of the Rodents, and the only one indigenous in Australia.

Key to the Genera.

1.	Molars two on each side in each jaw, smooth, two-lobed.	2
	Molars three on each side in each jaw, with tubercles.	3
2.	Toes partially webbed : aquatic.	Hydromys.
	Toes free : terrestrial.	Xeromys.
3.	Hind limbs elongated for leaping.	Conilurus.
	Hind limbs not elongated, adapted for running.	4
4.	Tail with rings of overlapping scales.	5
	Tail with the scales not overlapping, set edge to edge.	Uromys.
5.	Molars small.	Mus.
	Molars much broadened.	Mastacomys.

Genus Hydromys.

Molars, two on each side of each jaw, smooth with a transverse ridge. Toes partially webbed. True Water Rats. Australia, Tasmania, New Guinea.

The Water Rat.

Hydromys chrysogaster.

Long, lithe, weasel-shaped, attaining a length of twenty inches, including the long tail, which is, however, shorter than the head and body. They are thus giants among the Rats. The muzzle is long and pointed; the ears are not large or long.

We accept Mr. Oldfield Thomas's view that there is only one species of Australian Water Rat, and that the forms considered by various authors as specifically distinct are only colour varieties. The general colour is blackish or dark buff above, and either a rich orange-brown or yellowish-white beneath, while the tail is curiously parti-coloured, black at the base and changing suddenly to white about half way to the tip.

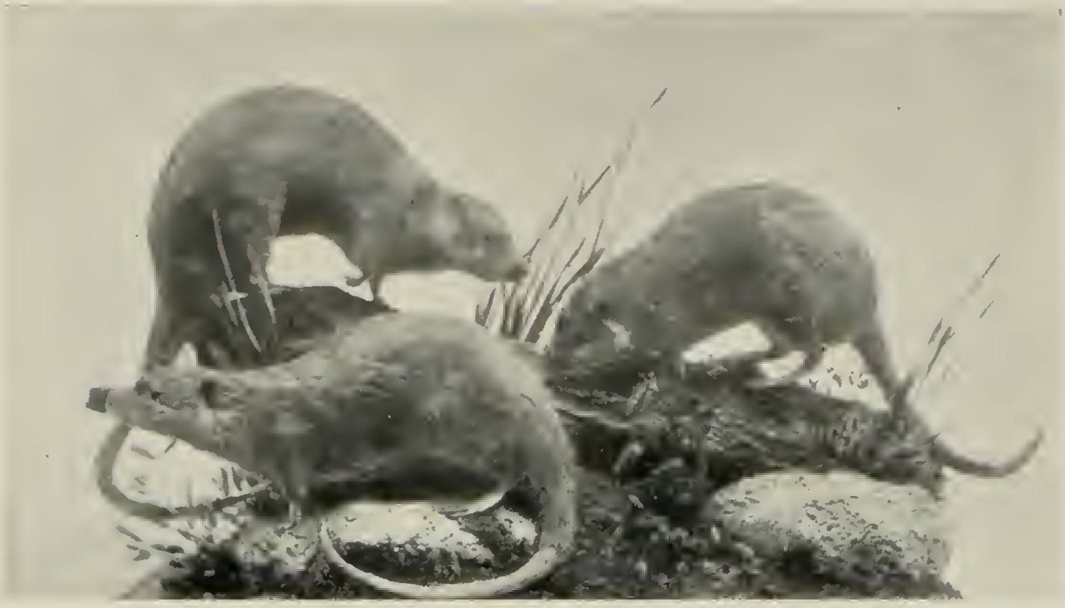
The Water Rats are not uncommon, but being shy creatures, and only active at night or in the dusk of the evening, they are more often heard than seen, as they splash into the water. They are purely aquatic animals, and frequent inlets of the sea as well as rivers and creeks. They feed on molluscs and crustaceans and other water animals, and on vegetable matter, having a general palate.

There are Water Rats in all parts of Australia and Tasmania. The Western are more of a dusky-brown colour, the whiskers are some black and some white, whereas in the

Eastern they are all black, and the tail is only white at the tip. There seem to be no structural differences between the Golden and the White-bellied, or between the Eastern and Western forms.

Genus Xeromys.

Form like that of the common Rat. Molars, two in each ramus. Toes unwebbed. Tail, with very fine hairs among the scales. Terrestrial. Queensland.



Aust. Mus.

Eastern Water Rat.

Thomas's Rat.

Xeromys myoides.

Head and body about four and a half inches, tail about three and a half inches. Ears short and rounded. Fur very short. Palms and soles naked; the former with five, the latter with six pads. Fifth toe without claw, pollex with a short broad nail, other toes with claws. Tail slender, with rather irregularly grouped very small scales. Dark slaty-grey above, white below; the tail pinkish, thinly covered with fine white hairs. Port Mackay, Queensland.

Genus Mus.

Incisors, narrow, not grooved; molars, small, three in each ramus, with three series of cusps across each tooth. Coronoid process of lower jaw well developed. Eyes and ears large.

Fur soft, usually without spines in Australian species. Hind limbs not specially elongated. Tail, long, nearly naked, with rings of overlapping scales. Eastern Hemisphere, except Madagascar. All parts of Australia.

This the largest genus of the Rodents, and indeed of all the Mammals, is represented in Australia by some 28 species as at present known, which seems to be quite a fair share of the 120 species, which Mr. Oldfield Thomas considers to be the tally for the world. Our knowledge of the Australian Muridæ is very incomplete and unsatisfactory, owing to the meagre descriptions given by Gould and others, which deal only with the external characters, and doubtless also to the fact that comparatively little attention has been given to secure specimens in numbers from the different parts of the continent. Hence it is difficult and indeed impossible to give a complete account of our Rats and Mice. Messrs. Higgins and Petterd made a vigorous collection of the Tasmanian kinds, and described eight new species. Unfortunately they relied on differences in external characters only, and as there is considerable variation in dimensions and in colouring, the distinctness of these species from one another and from the southern continental forms cannot be decisively determined.

When we come to employ the names Rat and Mouse to other Murids than the Black and Brown European Rats and the Domestic Mouse, to which they were in the first instance applied, we have to decide as to where we shall draw the line of separation. As the Black Rat is about seven inches long and the Common Mouse about six, there is fortunately not a great range of debatable dimensions. Of our 28 species of Mus then only five can be termed Mice, *M. albo-cinereus, M. novae-hollandiae, M. delicatulus, M. hermansburgensis*, and *M. simsoni*. The Rats range in length from the smallest, *M. nanus* and *M. argurus*, which are as long as the Black Rat, up to *M. terrae-reginae*, over 15, and *M. variabilis*, from Tasmania, 16 inches, which last is the largest of them all.

The Rats and Mice all form burrows of greater or less extent. The Dusky-footed Rat, *M. fuscipes*, like the English Water-Vole, is generally met with on the banks of creeks and lagoons, or in swampy localities among long grass and dense scrub, and swims with great ease and rapidity. Most of the others live in open scrub or grassy country, or among the sandhills. They feed normally on roots, seeds, and fruits, but do not restrict themselves to such diet.

These animals are doubtless remarkable for their fecundity, though little is known as to the number of litters brought forth each year. As there are four or more mammæ, the number of the young produced in a batch must be considerable. The numbers of the indigenous Rats and Mice are, however, well kept in check by the owls, monitors, snakes, and their other enemies.

Spencer gives the following account of those which he obtained in the Centre:—"Most of the specimens were collected in districts having similar features—hard sandy ground covered with sparse scrub of Mallee gum, Cassias, Eremophilas and Mulga. The Mice construct burrows, usually close to the base of a shrub. The burrow is simply a small hole in the ground just large enough to admit the mouse; it goes slanting steeply downwards for two, three, or even four feet. In each instance there appeared to be more than one pair inhabiting the same burrow. My informant says that he once counted nine specimens of the rather large species, with a whitish belly (*M. gouldi*) of which five were adult, and four young of fair size, together with other smaller young ones being suckled by two females. A rough nest is made of bits of grass lying on the floor of the burrow where it was slightly hollowed out, on which the females with young were lying. On smelling this grass in a burrow the blackfellow will at once say whether the animal is 'at home' or not."

The characters of the following better-known species are taken from Ogilby's "Catalogue of Australian Mammals," prepared for the Trustees of the Australian Museum, and to which we are indebted for much carefully verified information:—

The Dusky-footed Rat.

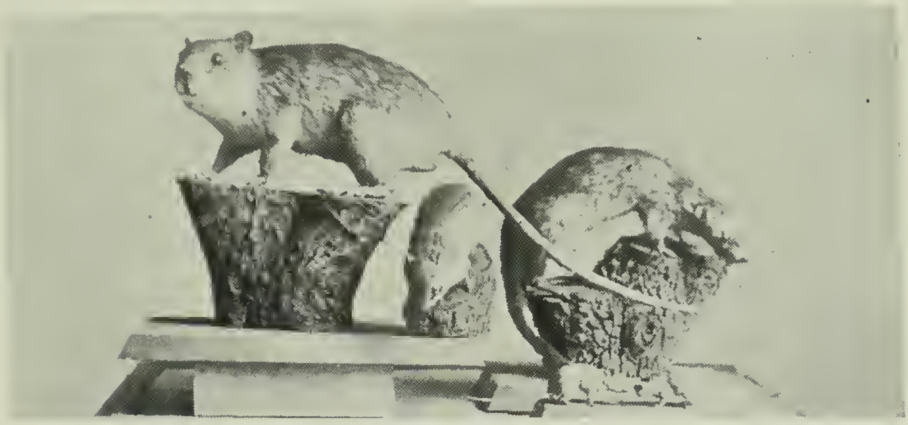
Mus fuscipes.

Form stout; ears moderate; tail, equal in length to the body; tarsi moderate; fur very long. General colour, above blackish-brown with an admixture of grey; below, greyish-white. Feet brown; tail black, sparingly covered with short bristly hairs. Incisors, orange. Head and body to six and a half inches; tail to four and a quarter inches. The southern half of Australia, Islands of Bass Strait, Tasmania.

The Allied Rat.

Mus assimilis.

Fur soft and silky. General colour, above light brown, very finely pencilled with black, below greyish-buff. Feet clothed with very fine silvery hairs. Tail, nearly naked, slightly longer than the body. Head and body to seven and a quarter inches; tail to six inches. From North-east Queensland to South-western Australia.



Giant Rat. Allied Rat. Water Rat.
European Mouse.
Some Australian Rats in comparison with Common Mouse.

The Sordid Rat.

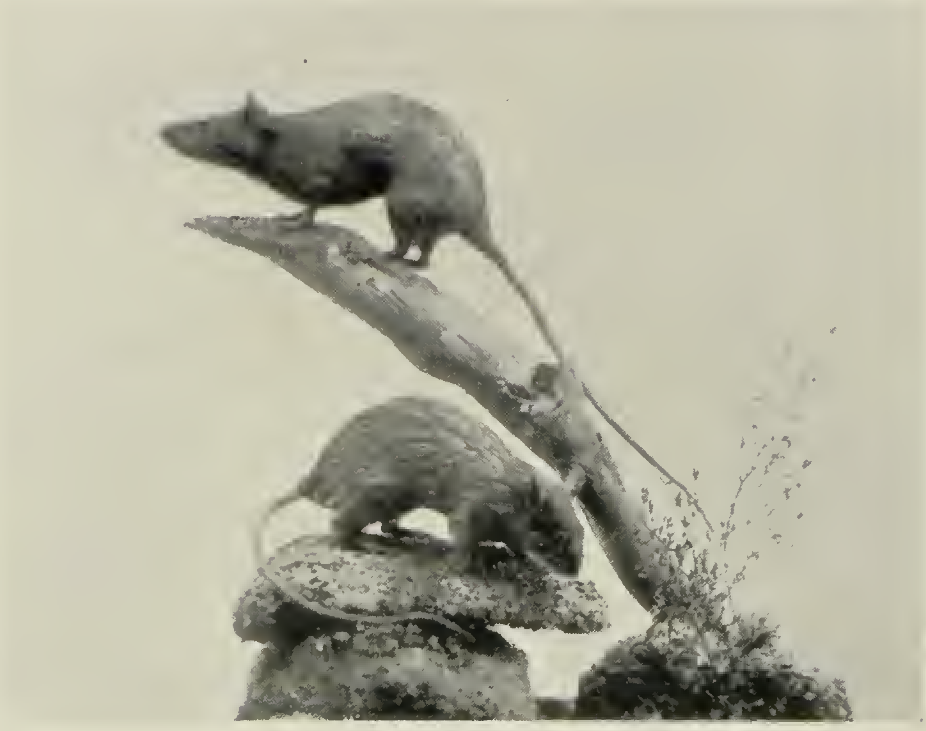
Mus sordidus.

Habit stout. Eyes rather large. Hair rather coarse and wiry. General colour, above grizzled black and brown, the former prevailing on the dorsal aspect; below, greyish-buff; fore-feet, greyish-brown; hind feet, silvery grey; tail about equal in length to the body, thinly clothed with extremely fine black hairs. Head and body to six and three-fourths inches; tail to five inches. Darling Downs, Queensland.

Gray's White-footed Rat.

Mus terrae-reginae.

Fur stiff and harsh both above and below, most of the hairs being developed into flattened channelled spines; many longer cylindrical hairs on the back. Whiskers, mixed black and white. Ears, rather large, rounded and naked. Feet very large and stout. Tail, almost naked, considerably shorter than the head and body. General colour, above dark reddish-brown, the longer hairs black; lips, lower parts of cheeks, all the under-surfaces and feet yellowish white; tail, dusky, irregularly marked with yellowish patches and rings. Head and body to eight and a quarter inches; tail to rather more than seven inches. Cape York, Queensland.



Aust. Mus.

Sordid Rat.

Gould's Rat.

Mus gouldi.

Ears rather large; tail shorter than the head and body; tarsi slender; fur long and soft. General colour, pale ochreous-yellow, interspersed above with numerous long black hairs; entire lower surfaces, the feet and the claws, white; ears brown; tail, brown above, yellowish-white below; upper incisors deep orange; lower yellow. Head and body to four and two-thirds inches; tail to three and a half inches. Central, Southern, and Eastern Australia.

Grey's Rat.

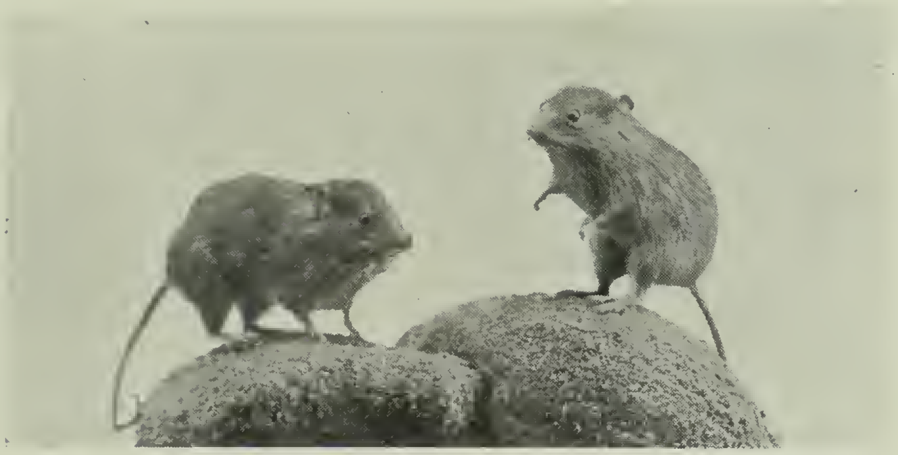
Mus greyi.

General colour, above intense reddish-brown, interspersed with long, slender, pale tipped black hairs; sides yellowish-brown; lower surfaces yellowish; feet reddish-brown; ears, nearly naked, with short greyish hairs; tail, brown, much shorter than the head and body. Head and body to six inches; tail to four and three-fourths inches. From South and Central Australia to North-east Queensland.

Little Rat.

Mus nanus.

Fur coarse; general colour above and the outer sides of the limbs brown, with numerous interspersed fine black hairs; below greyish-white, becoming lighter and forming a conspicuous patch beneath the tail; feet light brown; base of the fur bluish-grey; tail brown, shorter than the head and body. Head and body to four inches, tail, to three and a fourth inches. West Australia.



Austr. Mus.

Little Rat.

The Greyish-white Mouse.

Mus albocinereus.

Habit rather stout; ears moderate; tail nearly equal in length to the head and body; tarsi very slender; fur very long and soft. General colour, pale ashy-grey, with a slight brownish tint on the hinder part of the back; below, white, with a faint greyish tinge; head, greyish-white, pencilled with black; feet and tail, white, the latter with scattered black hairs above.

Slightly larger than *Mus musculus.* West Australia. "This pretty little Mouse inhabits the sandy districts bordering the sea-shore, particularly those at the back of the sand-hills to the northward of Fremantle.''—(Gould.)

The Pigmy Mouse.

Mus delicatulus.

Ears small; tarsi delicate; tail, slender, nearly as long as the head and body; fur soft and short. General colour, above pale yellowish-brown; sides, delicate yellow; lower part of the sides of the muzzle, entire under surfaces, and feet, white; fur of uniform colour on the throat and mid-line of the abdomen. Head and body, to two and a half inches; tail to two and a fourth inches. Port Essington, Northern Territory.

The most widely distributed species are *M. fuscipes*, spread over the southern half of the continent, and found in the islands of Bass Strait and in Tasmania, *M. assimilis*, occurring over all Australia except the North, Centre and North-West, and *M. gouldi* and *M. greyi*, which are found in the Centre, and to the South-east and East. Confined to the North, as tropical forms, are *M. burtoni*, *M. terrae-reginae* and *M. delicatulus*. In Western Australia we have *M. nanus* and *M. albo-cinereus*. *M. velutinus* is not known out of Tasmania, and the same applies to Messrs. Higgins and Petterd's eight species. Mr. Waite has described two species, *M. fieldi* and *M. hermansburgensis*, obtained in the Centre by Professor Spencer. The others are more local. On the Darling Downs live *M. sordidus* and *M. lineolatus*; in New South Wales *M. novae-hollandiae* and *M. tompsoni*; while in South Australia we have *M. vellerosus*, *M. manicatus* and *M. argurus*.

The Brown Rat and Domestic Mouse, *M. decumanus* and *M. musculus*, accompany man nearly everywhere he settles. The Mouse is already very common on the hard sandy and stony plains about Charlotte Waters, in the very centre. When a meteorological station was established on the summit of Mount Kosciusko, it soon became infested with Rats. In such out of the way places, only reached by horse traffic, it is surprising to find the beasts in such abundance, but they are adepts as stowaways, and travel free of charge amongst the stores; once arrived at the destination they are well able to fend for themselves, and increase in a phenomenally rapid manner.

Curiously enough it would seem that we have about Sydney and some parts of Melbourne members of the English Black Rat, *Mus rattus*. The form has been identified as the Black Rat by Mr. Oldfield Thomas, who states that the rats which are generally found on board ship are the Black, and not, as usually supposed, the Brown Rat. Probably driven away from the wharves and houses by the larger Brown Rats, the Black Rats have become Bush Rats, with the habit of climbing and building nests in trees. Hence Macleay described them as new with the specific name *arboricola*. They have been very plentiful about the old garden of Sir William Macleay, which surrounds the dwelling-place of the Linnean Society of New South Wales. So also has *Helix aspersa,* the Common Snail, and the Rats, perhaps because the Linnean Rooms only supply a feast of reason, have taken kindly to a snail diet. They always bite out the apex of the shell, and so at once proceed to extract the tenderest and most digestible of the soft parts of the snail.

Genus Conilurus (*Hapalotis*).

No coronoid process to the lower jaw. Ears and tail long, the latter more or less clothed with hair, often tufted at the tip. Hind limbs more or less elongated. Australia. Fossil in the Pleistocene.

This genus, even in the fossil state, is confined to Australia, and is of great interest as presenting in the Rodents an adaptation to a similar mode of progression to that adopted by the Kangaroos and the little *Antechinomys* amongst the Marsupials. The hind limbs are usually considerably lengthened, and the animal advances by leaps or hops. The Jerboa-Rats, as the name implies, recall the similar habit of another family of Rodents, the Jerboas of the North African deserts and the steppes of Central Asia, as well as the Jumping Mice of North America, and the Jumping Hare of Cape Colony.

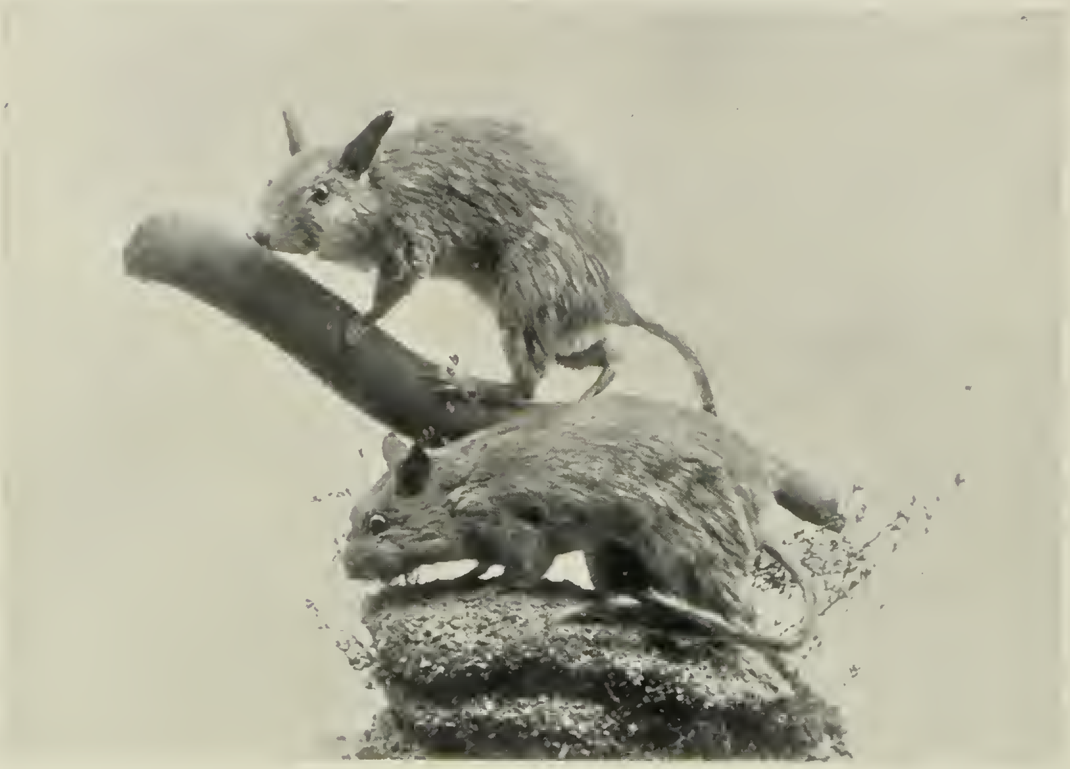
Fourteen species have been described. They are found on the coast in North Queensland, but are in general confined to the interior. The largest, *C. boweri* and *C. hirsutus* may attain a length of two feet. The smallest, *C. murinus,* is about as big as the introduced Brown Rat. Comparatively little is known of the habits of most of them.

The White-footed Jerboa Rat.

Conilurus albipes.

Above grey, tipped with ashy-brown, with numerous fine black-tipped hairs; whiskers and a narrow ring round the eye, black; below white; tail, dark brown above to near the tip, the rest white. Head and body to ten inches; tail about as long. South and South-east Australia.

Not common. Gould says it is "strictly nocturnal in its habits, sleeping during the day in the hollow limbs of prostrate trees, or such hollow branches of the large *Eucalypti* as are near the ground, in which situation it may be found curled up in a warm nest of dried leaves." Grey writes, "The specimen I send you, a female, had three young ones attached to its teats when it was caught; the mother has no pouch, but the young attach themselves with the same or even greater tenacity than is observable in the young of *Marsupiata*. While life remained in the mother, they remained attached to her teats by their mouths, and grasped her body with their claws, thereby causing her to present the appearance of a Marsupial *minus* the pouch." Hence Ogilby speculates as to whether *Conilurus* may not be a form in transition stage between the pouched and unpouched Mammals. This species is of antiquity, having been found in the Pleistocene of New South Wales.



Austr. Mus.

White-footed Jerboa Rat.

Nest-building Jerboa Rat.

Conilurus conditor.

Above greyish-brown, darkest down the middle of the head and back: below pale buff: hands and the large feet, brown; the tail, brown above, paler beneath. Head and body six inches; tail as long. Interior of Eastern Australia.

These animals combine together to construct large beehive shaped nests, as much as four feet in diameter and three feet high, about some central bush. They interlace the branches of this bush, and other sticks and branches which they collect, until the whole structure attains the size mentioned, and is strong enough to resist the attacks of a dog. One family or more may occupy the hut, in which there is a corresponding number of compartments, one for each family, communicating by passages. The compartments are lined with grass. This is the most elaborate "home" made by any Australian mammal, and reminds us on the small scale of the "lodges" of those other Rodents, the Beavers, which show a similar instinct, by which several families unite to build a structure which serves as home and fortress for them all.

Austr. Mus.

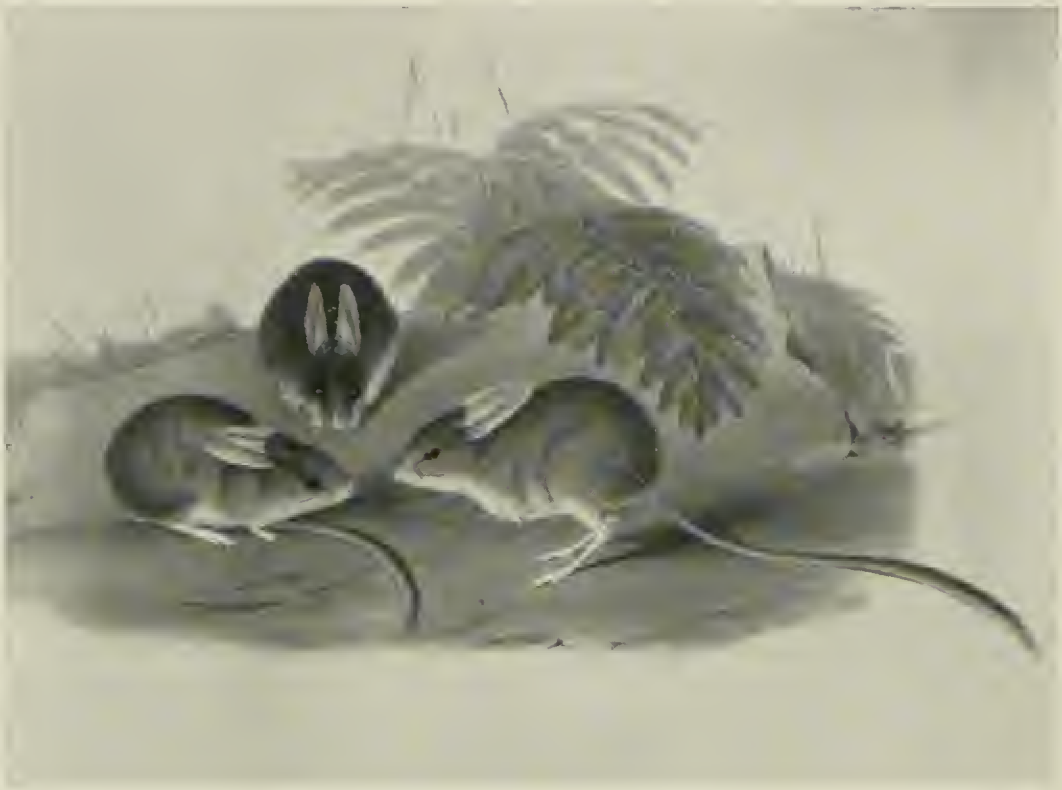
Long-tailed Rat.

The Long-tailed Jerboa Rat.

Conilurus longicaudatus.

Pale sandy above, white below; ears dark brown; apical half of the tail with black white-tipped hairs, the extreme tip white. Head and body to seven inches; tail to nine inches. Interior of Western Australia.

Gilbert says "the favourite haunt of this species is a stiff and clayey soil. It is also very partial to the mounds thrown up by 'Lesueur's Rat-Kangaroo and the Rabbit-Bandicoot.' It is less destructive to the sacks and bags of the store-rooms but, like *C. mitchelli*, is extremely fond of raisins."



Fawn-coloured Jerboa Rat. *After Gould.*

The Fawn-coloured Jerboa Rat.

Conilurus cervinus.

Delicate fawn above, with numerous fine black hairs; nose and under-surface, white; tail, pale brown above, lighter below. Head and body to four and a half inches; tail to five and a half inches. Interior of South Australia, extending to the centre.

Genus Mastacomys.

Like *Mus*, but with the molars remarkably broadened. Tasmania, Central Australia. Fossil in the Wellington Caves of New South Wales.

The Tasmanian or Dusky Broad-toothed Rat.

Mastacomys fuscus.

Nearly uniform dark greyish-brown. Ears rather large. Head and body to five and three-fifths inches; tail to three and three-fourths inches. Tasmania.

Mr. E. R. Waite has described specimens of a *Mastacomys* obtained by the Horn Expedition into Central Australia. They were immature, and he does not attach a specific name. The colour of the fur was reddish-brown above and yellowish below. The ears of medium size, greatly hidden in the fur. It is of interest as demonstrating the presence in the very centre of the continent of a form previously supposed to be confined in the living state to Tasmania.

Genus Uromys.

Like *Mus*, but with the scales of the tail set edge to edge, not overlapping. From Eastern Australia to the Aru Islands.

The Giant Rat.

Uromys macropus.

Reddish-grey above, white below; feet white. Head and body to fourteen and a half inches; tail as long. North-eastern Australia. The largest of our native Rodents.

The Buff-footed Rat.

Uromys cervinipes.

Sandy-brown above, mottled grey and buffy white below; feet fawn colour. Head and body, six inches; tail, five and a half inches. Eastern Australia.

ORDER CHIROPTERA.

Quadrupeds adapted for flight: the fingers greatly elongated and a wing-membrane stretching between the fingers, the sides of the body and the hind limbs: a smaller membrane connecting the tail and the hind limbs in the insectivorous bats.

Sub-order Megachiroptera.

Fruit Eating Bats.

Face, dog or rat-like; the nostrils simple openings without any leaf-like folds of the skin surrounding them; the ears simple, usually pointed, the sides of the conch uniting in a complete ring at the base. Crowns of the molar teeth smooth, with a longitudinal groove along the middle. The second finger usually bearing a claw. Tail very much reduced or absent. Feeding on fruits, flowers and honey.

Family Pteropodidae.

The Flying Foxes or Fruit Bats. Characters the same as those of the sub-order. Africa, Southern Asia, Australia, to Fiji and Samoa.

Key to the Genera.

1. Muzzle short, obtuse, and very thick.	Uronycteris (Harpyia).
Muzzle long, narrow and cylindrical.	2
2. Tongue quite moderate.	Pteropus.
Tongue extremely long and thin.	Macroglossus.

Genus Pteropus.

Size large or medium. Muzzle long, narrow, and cylindrical. Nostrils, projecting by their inner margins, the extremity of the muzzle deeply emarginate between them. Tongue of moderate length. Index finger with a distinct claw. Wing membrane joined to the sides of the back and the base of the second toe. Tail none. Fur of the nape of the neck and shoulders differing conspicuously from that of the back. Southern Asia and Eastern Australia, not in Tasmania.

The name Flying Foxes has been given to these Bats on account of the dog-like heads and reddish colour. They are naturally tropical or sub-tropical animals, though in Australia they extend as far south as Gippsland. They are eminently social, living in enormous communities. The bones are light, the muscles powerful, the wing-membranes large, and the powers of flight are in consequence remarkable. The hordes are thus able to travel rapidly from one district to another as the fruits become ripe. In the daytime they form camps in the inaccessible parts of the dense scrub and gullies, hanging by their claws from branches of high trees, with the head downwards and the wings folded over the breast. They look in the shade like huge black fruits, or, as Dr. Lucas says of one species which rests at certain times round the leaf-stalks of the cocoa-nut palm, like bunches of ripening cocoanuts. If there are too many to find accommodation on the branches they will cling one to another several deep, and in some cases the weight of the Bats breaks down the branch altogether. When evening comes on these marauders fly in immense flocks to the fig-trees, or to the orchards when fruit is to be had. There they scream and quarrel and gorge, making short noisy flapping flights, and the damage which such a flock will do to an orchard in a single night is incalculable. "They often waste more than they eat in finding food to their taste." Their boldness is great, and they are not unfrequent visitors to the Botanic Gardens and Hyde Park, in the very centre of Sydney, where they refresh themselves on the ripe Moreton Bay figs. They have a peculiar musky odour, especially the northern kinds, and this odour serves as a guide to the camps. Another unpleasant peculiarity is that they are commonly infested with vermin, and indeed they are never known to take a bath.

As there is so little in their favour, and the losses which they cause the fruit-growers are so great, very little affection is felt for them. The blacks certainly will feed on the flesh, and Leichhardt states that he found it to be an excellent article of food when on his travels. As fruit and honey eaters indeed the flesh should be sweet, but the exterior of the creature is so repulsive that it would require some courage to commence upon it. Dr. Lucas says that the blacks were accustomed to light fires all round a camp, when the smoke would rise and stupefy the sleeping Bats. They would then throw sticks or boomerangs and knock the creatures off their hold, and secure them as they fell. The only effective way to get rid of these fruit destroyers is to organise a battue, or series of battues, and even when thousands are killed in this way, others may later on come from long distances to attack the same orchards. They often chew Eucalyptus flowers to obtain the honey they contain.

When the young are strong enough to cling tightly to the fur of the mother, they are carried about by her in her nightly journeys. Dr. Ramsay states that in the month of August many of the females of *P. gouldi* had young of considerable size attached to the teats. He says that these Gould's Flying Foxes habitually cross at dusk from the mainland to the islands of Torres Strait, returning in the early morning to the scrub. There are five Australian species.

Flying-Fox with young. *Austr. Mus.*

The Grey-headed Flying Fox.

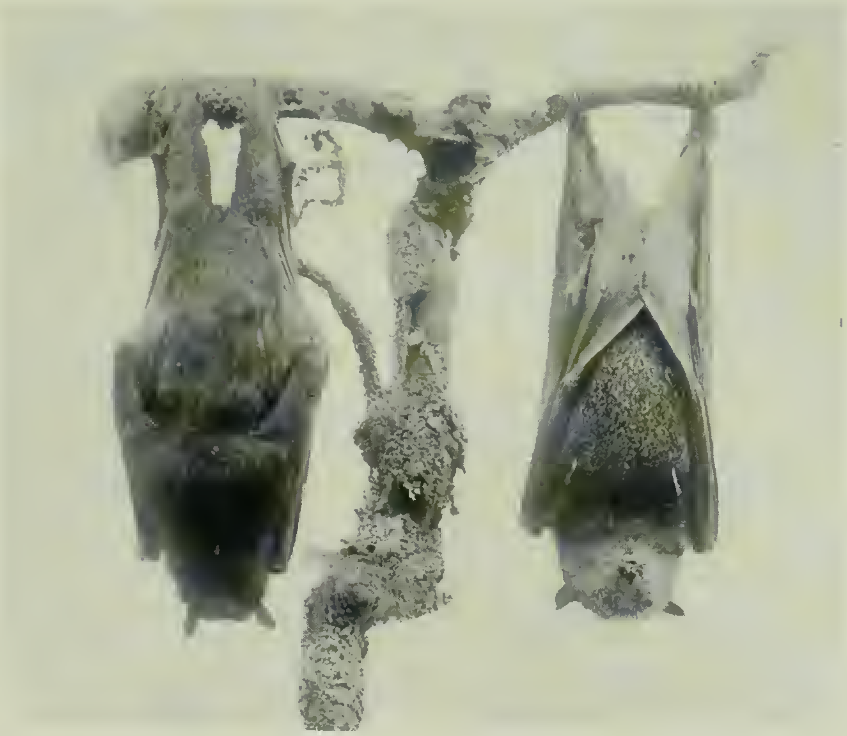
Pteropus poliocephalus.

Fur of the head, grey, with a yellowish tinge; neck, shoulders, and fore part of breast, bright reddish yellow; breast, from shoulder to shoulder, blackish grey; back, greyish-black. Head and body, about eight and a half inches; forearm, about six inches. North and East Australia.

The Dusky Flying Fox.

Pteropus brunneus.

Fur, generally yellowish-brown, the neck above brighter. Head and body, about eight inches; forearm, about four and a half inches. Percy Island, North-east Australia.



Grey-headed Flying-Fox. *Austr. Mus.*

Gould's Flying Fox.

Pteropus gouldi.

General colour, intensely black, with a few greyish or yellowish hairs; back of head and neck, dark ferruginous-brown, the neck sometimes bright yellow in adult males. Head and body, about nine inches; forearm, about six and a half inches. North-east Australia and the islands off the coast.

The Spectacled Flying Fox.

Pteropus conspicillatus.

Face and crown of the head, black, with a ring of pale brownish-yellow round each eye; back of head, nape and shoulders, pale yellowish; back and under surfaces, black. The largest species: head and body from ten to twelve inches; forearm, about seven inches. North-east Australia, and the islands off the coast; Yule Island, New Guinea.

The Collared Flying Fox.

Pteropus scapulatus.

General colour, reddish, or yellowish-brown, with a much paler collar around the neck; adult males with a light buff-coloured tuft of hairs on each shoulder; back and under surfaces, dark reddish-brown. Head and body, about nine inches; forearm, about five and a half inches. North-east Australia.

Genus Uronycteris (Harpyia).

Size medium. Muzzle short, obtuse, and very thick. Nostrils tubular, projecting abruptly for a considerable distance from the upper extremity of the muzzle. Tongue of moderate length. Index finger with a large claw. Wing-membrane from the sides of the back and from the base of the second toe. Tail short, half concealed in the interfemoral membrane.

Pallas' Fruit Bat.

Uronycteris cephalotes.

Above, reddish-brown, with a narrow almost black streak down the back; below, dull yellowish-white. Head and body, about four and a half inches; tail, not quite an inch; forearm, about three inches. York Peninsula.

Genus Macroglossus.

Size small. Muzzle very long, narrow, and cylindrical. Nostrils not projecting. Upper lip not grooved in front. Tongue very long, attenuated. Index finger with a distinct claw. Wing membrane from the sides and base of the fourth toe. Tail very short.

The Little Fruit Bat.

Macroglossus australis.

Tongue covered with numerous long brush-like papillæ. Tail generally quite concealed by the fur. Fur reddish-brown, unusually long for this family. Head and body, about two and a third inches; tail, about a third of an inch; forearm, about one and two-fifths inches. North and West Australia; from the Philippines, through the Malay Archipelago, eastward to New Ireland and the Solomon Islands. Though so small, said to be very destructive to fruit. Probably the most succulent.

Sub-order Microchiroptera.

Insectivorous Bats.

Face broad and short, the nostrils with or without extraordinary leaf-like folds or appendages of the skin; the ears with the two sides not meeting at the base, often complicated by the development of special lobes. Crowns of the molars with sharp tubercles, more or less separated by cross furrows. The second finger without a claw. Tail distinct, united to the interfemoral membrane. Feeding on insects, rarely on fruit or on blood. World wide.

Family Rhinolophidae.

The Horseshoe Bats.—The leaf-like cutaneous folds which surround the nostrils on the upper part of the muzzle are strongly developed, two folds in front grouped in the shape of a horseshoe. The ears are large and separate, with no tragus or forelobe. Tail produced to the outer margin of the interfemoral membrane. Eastern Hemisphere.

Genus Rhinolophus.

First toe with two joints (phalanges), others with three each. Base of the outer side of the ear-conch expanded, forming a large antitragus lobe. Nose-leaf very complicated, in three parts, the anterior (lower) horizontal, horseshoe-shaped, emarginate in front, the middle flattened in front and sending out a vertically compressed process, and the posterior triangular.

The Greater Horseshoe Bat.

Rhinolophus megaphyllus.

Horseshoe greatly developed, concealing the muzzle. Lower lip with three grooves. Fur pale mouse-coloured. Head and body, about two inches; tail, about one inch; forearm, nearly two inches. Queensland; the Richmond and Clarence, in New South Wales.

Genus Rhinonycteris.

All toes with two joints. Nose-leaf generally like that of *Rhinolophus.* Ears separate, without antitragus.

The Orange Horseshoe Bat.

Rhinonycteris aurantia.

Fur soft, bright orange in the male; pale yellow in the female. Head and body, nearly two inches; tail, rather over one inch. North and North-west Australia, especially abundant in the Coburg Peninsula. During the day it retires to hollow spouts and the holes in the gum trees.

Genus Hipposiderus (Phyllorhina).

All toes with two joints. Nose-leaf of three portions, the anterior horseshoe-shaped, not emarginate in front, the middle broad and heart-shaped without any projecting process, and the posterior broad, erect and concave in front. Ears separate, without antitragus.

There are two species, the Fawn-coloured Horseshoe Bat, *H. cervinus*, with the fur reddish brown, of the dimensions of *Rhinolophus megaphyllus*, and found in the York Peninsula, as well as in the Aru Islands, New Guinea, Waigiou, and in the Duke of York Islands; and the Brown Horseshoe Bat, *H. bicolor* var. *aruensis*, with the fur very dark brown, nearly black above, and greyish-brown below, found in Albany Island, Cape York, as well as in the Aru Islands.

Family Nycteridae.

The leaf-like cutaneous folds which surround the nostrils strongly developed, the anterior portion expanded and sending a vertical process backwards. The ears very large, united, with prominent forelobes (tragi). Middle finger with two joints. The warmer parts of the Eastern Hemisphere.

Genus Megaderma.

Muzzle elongated; lower lip projecting beyond the upper. Tail very short in the base of the interfemoral membrane. Tragus or earlet long and bifid. Africa, Southern Asia, Australia.

These Blood-sucking Bats feed on the blood and flesh of smaller Bats and other small mammals, and even frogs and fishes. They have no incisor teeth in the upper jaw, the mouth and muzzle being adapted to the blood-sucking habit.

The Great Blood-sucking Bat.

Megaderma gigas.

Nose-leaf with convex sides, the anterior concave disc large, its external margin thickened and adherent to the muzzle underneath, carrying a vertical process above. Ears longer than the head, united to half their length, oval and rounded off above; the tragus large, bifid with a long hind and short fore branch. Lower jaw projecting beyond the upper. Head and body about five and a third inches; tail rudimentary; forearm, about four and a fifth inches. Wilson's River, Central Queensland.

Family Vespertilionidae.

The typical Bats. The nostrils without, or with only a very simple. nose-leaf, and simply round or crescent-shaped apertures. The ears are of medium or large size, usually separate, and with large earlets (tragi). Tail long, produced to the hinder margin of the large interfemoral membrane. Upper incisors separated in the middle by a wide toothless space. Temperate and warm regions of both Hemispheres. All insectivorous.

Genus Nyctophilus.

Muzzle narrow, thinly covered with short hairs; nose-leaf simple; ears, large, oval. united at the base by a membrane which runs across the top of the head, with a short broad tragus. Incisors of the upper jaw, two, separated by a space. close to the canines. Australian Region, where it takes the place of the Northern *Plecotus,* to which the British Long-eared Bat belongs.

The Australian Long-eared Bat.

Nyctophilus timoriensis.

Ears longer than the head. Heel-spurs half an inch long. Fur, long, thick, and soft, dark to light brown above; below, from pale brown to white. The membranes are dark brown. Head and body, about two inches; tail and forearm each rather under two inches. In varied size and colouring. Spread over all Australia, Tasmania, and neighbouring islands, to Fiji. These bats are sometimes found in great numbers in the hollow spouts of the gum-trees, from which they emerge in the dusk to flit about the shrubs and smaller trees in search of moths and other insects.

Walker's Bat.

Nyctophilus walkeri.

Rather smaller than the preceding. Ears not so long as the head. Fur shorter and paler, especially below. Adelaide River, Northern Territory.

Genus Vesperugo.

Form rather stout; muzzle very broad and obtuse; crown of the head flat, very little raised above the face line; nostrils simple, crescent-shaped, without nose-leaf; ears short, broad, separate; earlet short and obtuse; the outer margins of the ear sweep round on the cheek below the tragus so as nearly to reach the angle of the mouth. Upper incisors, four, in pairs separated by a wide space. Europe, Asia, and Australia.

The Little Bat.

Vesperugo pumilus.

Fur above and below black. Head and body, about one and a half inch; tail, not quite so long; forearm, about one and a fourth inch. All Australia and Tasmania.

The Yellow-headed Bat.

Vesperugo abramus.

Fur, dark-brown above, tipped with light yellowish-brown; head and neck, wholly yellowish-brown; below, sooty-brown, the tips lighter than those of the upper surface. Head and body, under two inches; tail, about one and a half inch; forearm, about one and a third inch. A species of wide distribution, called in India the Coromandel Bat, but spread over Ceylon, China, to Japan, the Malaysian Islands and Northern Australia. In summer it travels westward to Central Europe.

Krefft's Bat.

Vesperugo kreffti.

Fur, above dark reddish-brown; below, paler. Head and body nearly two and a half inches; tail, about two inches; forearm, rather shorter than the tail. New South Wales, Tasmania.

Genus Chalinolobus.

Muzzle broad and short. Crown of the head slightly raised above the face line. Cutaneous lobes at the angles of the mouth. Ears short. ovoid; tragus curving inwards. Upper incisors, four, the inner much larger, separated from the canines. Heel spurs, long.

The Chocolate Bat.

Chalinolobus morio.

Ears rounded above. Fur, above dark brown, almost black, on the head and shoulders passing into dark chestnut-brown behind; below, paler. Head and body about one and four-fifths inch; tail, rather shorter; forearm, about one and a half inch. From Southern Queensland through New South Wales and Victoria, to South Australia, Tasmania, New Zealand.

Dobson's Bat.

Chalinolobus signifer.

Like the preceding, but carrying an erect transverse process on the face between the eyes. South Central Queensland.

Gould's Bat.

Chalinolobus gouldi.

Ears rather angular above. Fur above on the head, neck, and shoulders black with a faint reddish tinge; back, yellowish-brown; below the breast reddish-grey, other parts pale yellowish-white. Head and body about two and a half inches; tail about two and a quarter inches; forearm under two inches. Eastern and South-eastern Australia and Tasmania.

The Pied Bat.

Chalinolobus nigro-griseus.

Ears very rhomboidal. Fur, above deep black with pale tips to the hairs; below similar, with ashy tips. Head and body, about one and three-fourths inch; tail and forearm, each one and a third inch. Northern and Eastern Australia.

Genus Scotophilus.

Form stout. Muzzle short, naked. Crown of the head only slightly raised above the face line. Nostrils close together, simple, lunate, their inner margins projecting. Ears short, longer than broad, with the outer margins nearly reaching round to the angle of the mouth, tragus tapering, curved inwards. Upper incisors, two, close to the canines. Limbs strong, wing-membranes thick and leathery, nearly naked.

Both of our species have a chestnut-brown fur, Rüppell's Bat being usually darker.

Rüppell's Bat.

Scotophilus rueppelli.

Head and body about two and three-fourths inches; tail not quite two inches; forearm two inches. New South Wales.

Grey's Bat.

Scotophilus greyi.

Head and body about one and three-fourths inches; tail and forearm, each about one and one-fifth inch. Port Essington; Liverpool Ranges.

Genus Vespertilio.

Muzzle long, thickly covered with hairs. Crown of head vaulted, slightly raised above the face line. Nostrils simple, crescentic, not projecting. Ears oval, longer than broad, separate, the outer margins not produced towards the angle of the mouth. Upper incisors four, nearly equal, in pairs close to the canines. Cosmopolitan.

The Great-footed Bat.

Vespertilio adversus.

Interfemoral membrane forming a very acute angle behind. Feet, relatively very large, half an inch in length. Head and body, about two inches; tail, about one and three-fourths inch; forearm, about one and a half inch. From Siam, through Java, Borneo, and Celebes, to the Northern half of Australia.

The Small-footed Bat.

Vespertilio australis.

Interfemoral membrane forming an obtuse angle behind. Feet, moderate, one-third of an inch in length. Head and body, about one and four-fifths inch; tail and forearm, about one and a half inch. New South Wales.

Genus Kerivoula.

Muzzle narrow, elongated. Crown of the head considerably vaulted. Nostrils simple, circular. Ears funnel shaped, diaphanous, studded with glandular papillæ; tragus long, narrow, acute; the outer margins sweeping forwards. Heel spurs long and stout.

The Eastern Forest Bat.

Kerivoula papuensis.

Fur, above dark brown, with shining yellow tips; below, paler brown, with shining grey tips; forearm clothed with short golden hairs. Head and body, about one and four-fifths inch; tail, the same; forearm, about one and a half inch. North-eastern Australia and South-eastern New Guinea.

Genus Miniopterus.

Muzzle rather short and broad. Crown of the head abruptly and very considerably raised above the face line. Nostrils simple, lunate. Ears rhomboidal, separate, the outer margins sweeping round nearly to the angle of the mouth. Upper incisors four, in pairs separated from each other and from the canines. Eastern Hemisphere.

Schreibers' Bat.

Miniopterus schreibersi.

Interfemoral membrane nearly naked above. Fur variable, greyish or reddish. Head and body, about two and a fifth inches; tail tho same; forearm, about one and three-fourths inch. A species of remarkable geographical range, from Japan down to Australia, west through Southern Asia and Asia Minor, into Southern Europe as far north as Switzerland, and over the whole of Africa and in Madagascar.

Tomes' Bat.

Miniopterus australis.

Interfemoral membrane clothed with fur in the fore part. Fur, dark reddish-brown above; below, dark brown with greyish tips. Head and body, about one and three-fourths inch; tail, the same; forearm, rather shorter. Australia; Loyalty Islands.

Family Emballonuridae.

The nostrils without a nose-leaf, simple or valvular. The ears large, usually united, with short tragi. Tail partially free, either perforating the interfemoral membrane, and appearing upon its upper surface, or produced far beyond its hinder margin. First joint of the middle finger when in repose folded on the wrist. Upper incisors separated in front. Tropical and sub-tropical regions of both Hemispheres. All insectivorous.

Genus Taphozous.

Muzzle conical. Nostrils valvular. Ears separate; tragus short, hatchet-shaped, expanded above; outer margins sweep round upon the cheek to near the angle of the mouth. Long heel spurs for stretching the interfemoral membrane. Tail slender, perforating the interfemoral membrane, and emerging from it. Legs long and slender. A peculiar glandular pouch under the chin, chiefly in the males. Upper incisors two, weak, or absent.

The Sharp-nosed Bat.

Taphozous flaviventris.

Fur, rather long and dense, hairs pure white at the base, the rest dark brown above, paler below. Head and body, about three inches; tail, about one and a third inch; forearm, about two and three-fourths inches. Australia and New Guinea.

The Yellow-bellied Bat.

Taphozous flaviventris.

Larger than the preceding. Fur, pale ochreous yellow below. New South Wales.

Leche's Bat.

Taphozous affinis.

Fur, above black, the hairs with white bases; below, pure silky white. Head and body, about three inches; tail, about one inch; forearm, nearly three inches. South Australia.

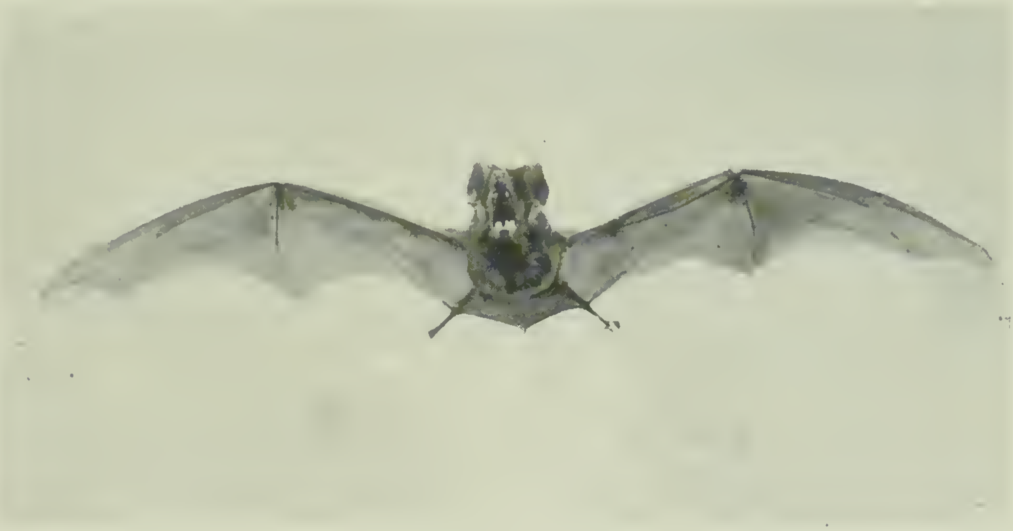
Genus Nyctonomus.

Muzzle projecting considerably beyond the lower jaw, abruptly truncated; upper lip generally deeply grooved by vertical wrinkles. Nostrils simple circular. Ears large, united on the muzzle, tragus short. Tail thick, produced far beyond the hind border of the interfemoral membrane, which is movable along it. Legs short and strong. Upper incisors two, strong, separated from each other and from the canines.

The Plicated Bat.

Nyctonomus plicatus.

Ears united by a low band in front. Upper lip, very thick, deeply grooved by vertical wrinkles. No gular (throat) sac. Fur, very soft and dense; above, bluish or smoky-black; below, paler. Head and body, about two and three-fourths inches; tail, about one and three-fourths inch; forearm, nearly two inches. India to Borneo and the Philippines; South Australia and Tasmania.



White-striped Bat. *Austr. Mus.*

The White-striped Bat.

Nyctonomus australis.

Ears, large, not united. A gular sac with outwardly projecting hairs in the male. Fur, moderately long and dense, above dark reddish-brown; below, paler; a white stripe on the under surface of the wing-membrane from the side of the body outwards, mixed with brown in the female. Head and body, about three inches; tail, about one and three-fourths inch; forearm about two and a third inches. Australia and New Guinea.

Leche's White-striped Bat, *N. albidus*, differs from the preceding in that the ears are longer and united by a low band, and the gular sac and the white stripe along the inner border of the wing beneath are fully developed in the female. The dimensions are rather larger. South Australia.

The Norfolk Island Bat.

Nyctonomus norfolcensis.

Ears, separate, triangular. Upper lip with shallow wrinkles. Fur, reddish-brown above, paler beneath. Head and body, rather over two inches; tail about one and a fourth inch; forearm, about one and a half inch. Eastern Australia; Norfolk Island.

Peters' Bat, *N. petersi*, is very nearly allied to the preceding, but there is no gular sac in either sex. South Australia.

Order Cetacea.

Aquatic animals with long bodies adapted for swimming, no hind limbs; a horizontal tail fin and usually a vertical dorsal fin; skin smooth, covering a very thick layer of fat; mammæ ventral.

The Whales and their allies are among the most remarkable of the Mammals, being warm-blooded animals, breathing air only, and yet so entirely aquatic that they never leave the water of their own accord. They are absolutely unprotected by hair, without even eyelashes. The thick layer of fat, the blubber, under the skin serves to retain the animal heat, which is important as the Whales are most abundant in cold waters. The tail is horizontal, not vertical as in Fishes, to enable the animal to plunge downwards rapidly and to raise itself easily to the surface, for it is necessary to rise frequently in order to take a supply of fresh air into the lungs. Further, the nostrils are situated usually on the highest point of the head, to enable the animal to breathe without trouble, while at the same time exposing as little as possible of the body above the surface, where it is most liable to attack by dangerous foes. The "spouting" is the discharge of the expired air, and is not by any means a mere tossing up of the sea-water, most of the spray being the warm water vapour from the lungs condensed on coming into contact with the cooler atmosphere. The animal can feed under water, the long larynx being brought into continuity with the passage of the blow-hole, the latter being closed by muscular action, and in this way no water enters the lungs.

The eyes are usually small, and the ear-openings minute without a vestige of an external ear. Doubtless in connection with the greater rapidity and loudness with which sounds travel through water, the bones of the internal ear, which are very small and delicate in all other Mammals, are exceedingly massive and dense. Hence more frequently than any other parts of the Cetacean skeleton, these earbones are found on the floors of the deep seas, and are preserved in the fossil state.

The Cetaceans are all predacious, feeding on other animals, fish, swimming and floating crustacea, pteropods, jelly-fish, cuttle-fish, and squids, while the Killer Whales (*Orca*) prey on seals and dolphins, and will attack the larger Whales. Many are gregarious, hunting in schools. All our Cetaceans are purely marine, but some forms are fluviatile, one even ascending the Amazon up to its remote sources among the Peruvian Lakes. They are in general timid, and flee from the presence of man; the brain is large and much convoluted, and they show affectionate interest in their fellows. The females seek the shelter of shallow bays and inlets at the breeding season, and show the greatest tenderness in the care of the young over a long period.

Key to the Families.

1.	Mouth with baleen.	Balænidæ.
	Mouth without baleen.	2
2.	Teeth in both jaws.	Delphinidæ.
	Teeth in lower jaw only.	Physeteridæ.

Family Balaenidae.

The Whalebone Whales.

Teeth never developed, but the palate with plates of baleen, or whalebone. Skull symmetrical.

The Whalebone Whales form the most important group commercially. Four species occur in our seas, of which the Southern Right Whale attains a length of sixty to seventy feet, but the fishing industry is nearly extinct, even in Tasmania.

The baleen which, with the huge tongue, fills the dome-like cavity of the mouth, consists of a series of plates attached to the roof, set obliquely and frayed at their inner edges. It acts as a sieve in straining off the water taken into the mouth when the Whale is feeding on the small fry of the ocean. Sir W. H.

Flower states that the Whale fills its huge mouth with water containing shoals of the small creatures, and then closes the jaws and raises the tongue, forcing out the water through the hairy fringes of the whalebone plates, and retaining the living prey to be swallowed. Each plate of the Northern Right Whale weighs about seven pounds, and a single Whale may yield as much as a ton and three-quarters of whalebone.

Key to the Genera.

1.	Throat smooth, baleen long.	2
	Throat plaited, baleen short.	3
2.	No dorsal fin, baleen black.	Balæna.
	A dorsal fin, baleen yellow with a black edge.	Neobalæna.
3.	Flipper long, about a fourth of the length of the whole body.	Megaptera.
	Flipper short.	Balænoptera.

Genus Balaena.

Head about two-sevenths of the total length. Skin of throat smooth. No dorsal fin. Length of the baleen six or seven times the breadth at the base.

The Southern Right Whale.

Balaena australis.

Black or blackish-grey, part of the throat and belly white. Length, up to seventy feet; that of the baleen, six feet. Temperate and Frigid seas of the Southern Hemisphere.

This valuable Whale was once very abundant in the Tasman Sea and in the Southern Ocean. In New Zealand the females used to visit the shallow bays to calve in the winter months, and were joined by the males in spring, and all went to sea together. Comparatively few come now within reach of our coasts, and the industry, which was formerly extensive, is now confined to occasional expeditions into Antarctic centres, and has no home in Australia. The Right Whale is a slow swimmer, making not more than four knots an hour. It feeds in the manner previously described on small surface molluscs and crustacea.

Genus Neobalaena.

Head, about one-fourth of the total length. Skin of the throat smooth. A small falcate dorsal fin.

Sulphur-Bottom Whale.

Austr. Mus.

The Pigmy Right Whale.

Neobalaena marginata.

Baleen, pale yellow with a narrow black margin. Said to reach 20 feet in length. Length of the baleen, two feet. Coasts of Southern Australia and New Zealand, but apparently very rare and imperfectly known.

Genus Megaptera.

Head moderate. Skin of throat plicated. The dorsal fin very low. Flippers long and narrow, about one-fourth of the length of the animal.

The Hump-back Whale.

Megaptera boops.

Back and sides black; belly, yellowish white; flippers, white. Baleen, black. Usual length, 45 to 50 feet, but may reach 60 feet. All seas except the tropical and sub-tropical.

The characteristic hump is the low dorsal fin. The flippers are notched irregularly on both edges. The baleen is short and coarse, and much less valuable than that of the Right Whales; hence the Hump-backs are seldom fished even in the North. They are said to delight at times in springing out of the water and dashing into it again, apparently in play or taking exercise. Probably migratory, like many of the Whales. Numbers were seen sporting in the ocean off the coast near Sydney in the spring of 1906.

Genus Balaenoptera.

Head small and flat. Skin of throat plicated. A small falcate dorsal fin. Flippers short.

The Sulphur-bottom Whale.

Balaenoptera huttoni.

Dark green above, shading off gradually to yellowish-white below; a white bar across the flippers. Baleen, yellow with a narrow dark margin, short and coarse. Perhaps up to 30 feet in length. Seas of New South Wales and New Zealand.

This Whalebone Whale pursues fishes, and small sharks have been discovered in its stomach. Called the Pike Whale in New Zealand.

Family Physeteridae.

The Toothed Whales.

No functional teeth in the upper jaw. Skull strikingly asymmetrical about the blow-holes.

Key to the Genera.

	With several pairs of teeth in the lower jaw.	1
	One pair of teeth in the lower jaw.	2
1.	Large—20 to 30 pairs of teeth.	Physeter.
	Small—9 to 12 pairs of teeth.	Kogia.
2.	One pair of teeth in front.	Hyperoodon.
	One pair of teeth near the middle.	Mesoplodon.

Genus Physeter.

Head about one-third of the length of the body, very massive, high and truncated in front. Teeth of the lower jaw short and conical. Blow-hole single, near the front of the head, slightly to the left. Flippers short and broad. Dorsal fin very low. Cosmopolitan.

The Sperm Whale or Cachalot.

Physeter macrocephalus.

Black above, lighter on the sides, and silvery grey underneath. The upper jaw overhangs the lower. The males attain a length of sixty feet, or even seventy. The females are not so large. The upper surface of the broad shoe-shaped skull has a large basin-like cavity, in which in the soft parts the solid fatty substance, spermaceti, is lodged. This substance is also diffused through the blubber. Cosmopolitan.

The Sperm Whales are gregarious, and go about in schools of from a dozen to fifty or sixty, though single individuals are met with. The younger males are apt to be fierce, and there is more danger in the fishery than in that of the Right Whale. The animal can be recognised in the distance by the single column of spray when it spouts, the column being directed obliquely forwards. It will remain at the surface for ten or fifteen minutes, and then descend, staying under water for an hour. They swim rather more quickly than the Right Whale, and will sometimes fling themselves out of the water, "breaching" as the whalers call it, or they will "lobtail," beating the sea violently with their flat tails. They feed on fish and the cephalopods, cuttle and squid.

The spermaceti is found dissolved in oil, and the fluid is collected in bucketfuls, and preserved in casks. The oil is afterwards separated, and the spermaceti obtained as a pearly white crystalline substance generally resembling white wax. It is used as an emollient in pharmacy. Sperm oil is exceedingly valuable, but the industry is generally declining, and has now no base in Australia.

The females are strongly affectionate, standing by and assisting one another if attacked, and showing the greatest devotion to their young ones. The mother will not leave the young, even if she be mortally wounded with the harpoon.

Genus Kogia.

Head about one-sixth of the length of the body, obtusely pointed in front. Teeth of the lower jaw slender, pointed and curved. Blow-hole situated further back than in Physeter. Flippers short. Dorsal fin well-marked, nearer the tail. Southern Seas.

The Short-headed Sperm Whale.

Kogia breviceps.

Black above, greyish or yellowish-white below. Length, 8 to 10 feet. Porpoise-like in general appearance. Southern Seas. Rare.

Genus Hyperoodon.

Upper surface of head in front of the blow-hole very prominent and rounded, rising abruptly from the small distinct snout. A pair of small conical teeth in the front of the lower jaw, concealed by the gum. Northern and Southern Seas.

The Southern Bottle-nose Whale.

Hyperoodon planifrons.

Only known from mutilated skull found on the beach of Lewis Island, Dampier's Archipelago.

Genus Mesoplodon.

Head with a long beak. A much compressed and pointed tooth on each side somewhere about the middle of the jaw. Dorsal fin pointed at the apex. Black, variously mottled with white, especially on the top of the head. The species are distinguishable only by the skulls. Cosmopolitan. Specimens rarely secured.

The Long-toothed Whale, *M. layardi*, has the two teeth large, strongly compressed, and growing upwards, backwards, and inwards over the upper jaw. Up to 15 feet. Seas of New South Wales, New Zealand, and the Cape of Good Hope.

The Massive-toothed Whale, *M. densirostris*, has the two teeth very massive, and growing upright. Up to 15 feet. Lord Howe Island; Seychelles.

The Small-toothed Whale, *M. grayi*, has the two teeth small and triangular, and a series of small conical teeth in the fore part of the upper jaw. Up to 18 feet. New South Wales and New Zealand.

Family Delphinidae.

Numerous teeth in both jaws. Blow-hole transverse, crescentic, with the horns of the crescent pointing forwards. Cosmopolitan.

Key to the Genera.

1. Not beaked. Teeth fewer than 20 in each jaw.	2
Beaked. Teeth more than 20 in each jaw.	5
2. Teeth very strong.	3
Teeth small.	4
3. Flipper large, ovate.	Orca.
Flipper moderate, narrow.	Pseudorca.
4. A dorsal fin.	Globicephalus.
No dorsal fin.	Delphinapterus.
5. Teeth more than 30 in each jaw.	Delphinus.
Teeth fewer than 30 in each jaw.	6
6. Teeth large.	Tursiops.
Teeth slender.	Sotalia.

Genus Delphinapterus.

Teeth from 8 to 10 in each jaw, rather small, separated. Flippers short and broad. No dorsal fin, but a low ridge in its place. All cold seas.

The Beluga or White Whale.

Delphinapterus leucas.

White. Length, 12 to 16 feet.

The Australian claim on the White Whale is very slender, a single skull in the British Museum being said to be from the coast of New Holland. It is included, however, in the New Zealand fauna, and it is to be hoped that other individuals may visit our waters, and receive a kindly welcome. It is very gregarious, sportive, and easily tamed, when it becomes very docile, and shows considerable intelligence. One, which was kept in a tank in America, allowed itself to be freely handled, and was trained to draw a car around its tank. The skin is of a creamy white, and unfortunately for the animal makes the excellent "Porpoise" leather of the market. The Greenlanders largely depend on this Whale for their sustenance, capturing it in nets at the entrances of the inlets. They dry the flesh for winter food, hoard the oil, and employ the skins in various ways.

Genus Orca.

Teeth about 12 in each jaw, very large and powerful. Flippers very large, nearly as broad as long. Dorsal fin near the middle of the back, high and pointed. Cosmopolitan.

The Killer Whale.

Orca gladiator.

Head blunt, evenly rounded. Dorsal fin up to one-fifth of the length of the body. Glossy black above, white below, the colours sharply defined; a white patch over the eye. Length, 18 to 30 feet. Cosmopolitan.

These monsters are cruelly rapacious, and have been well styled the wolves of the ocean. They associate in small packs of four or five, and play havoc amongst the dolphins, porpoises, seals and whales. When attacking a Right Whale they frequently have a Thresher Shark to help them, which does so by springing out of the water and bringing its scythe-like tail down upon the back of the hapless whale, which it deeply gashes. The huge tongue is the only part of the whale that is eaten by the Killers. They are quicker in the water than even the porpoises, and their greed is unlimited. An idea of their voracity may be gathered from a statement by Eschricht, who says that he took from the stomach of one individual thirteen porpoises and fourteen dolphins, while the glutton had been choked in his attempt to swallow a fifteenth. This is a sufficiently large meal for the Killer, or even for the reader, to easily swallow. Three or four Killers will grapple with the largest Whalebone Whale, and indeed their chief trouble is in dividing up the carcase, for the poor monster is entirely at their mercy. They have been known to attack a white-painted herring boat, mistaking it for a White Whale. The Whale fishermen of Twofold Bay, New South Wales, have established a singular partnership with the Killers. The latter are in the habit of driving the Whales into the Bay, where the men dispatch them, rewarding the monsters with the offal. The fishermen are loud in the praises of their allies, and strongly resent any interference with them.

Genus Pseudorca.

Teeth 8 in the upper, 10 in the lower jaw. Flippers moderate, narrow and pointed. Dorsal fin near the middle of the back, moderate, falcate.

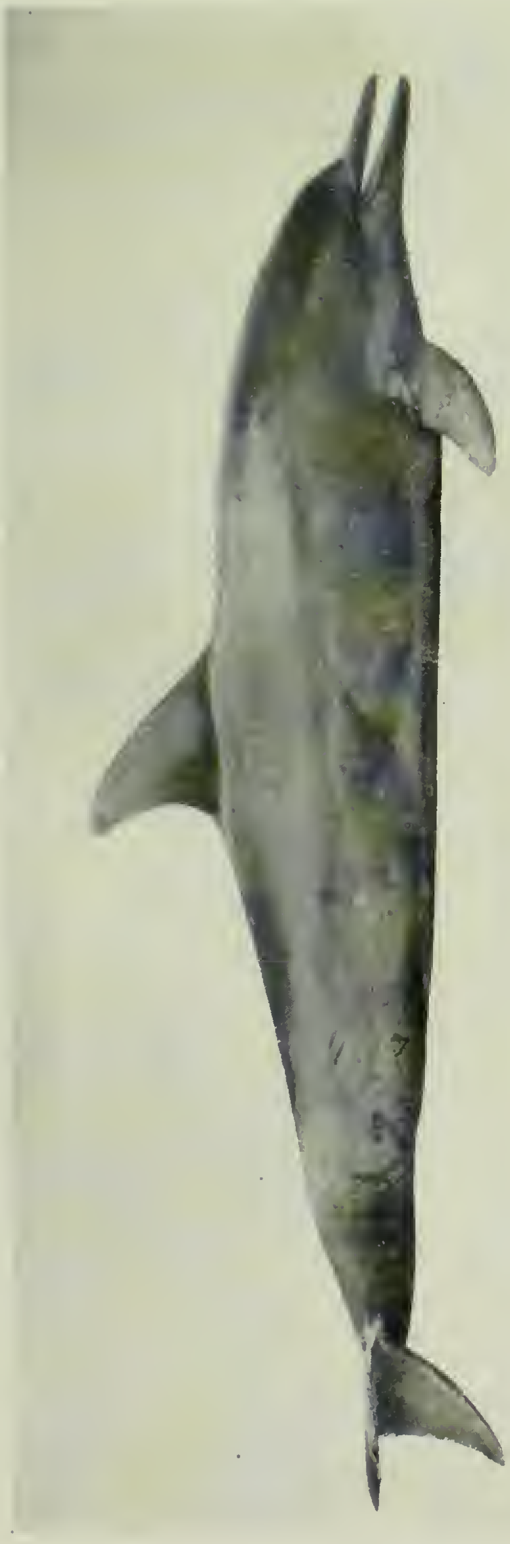
The Tasmanian Killer.

Pseudorca crassidens.

Of much the same size and colour as the Killer. Coast of Tasmania, New South Wales, and Lord Howe Island.

Genus Globicephalus.

Head with a rounded massive boss. Teeth about 12 in each jaw, small and conical, and widely separated. Flippers very long and narrow. Dorsal fin rather low, triangular. Cosmopolitan.



Common Dolphin.

Austr. Mus.

The Pilot Whale.

Globicephalus melas.

Shining jet-black, with a white stripe along the throat and abdomen. Length, from 16 to 25 feet. Extra-tropical seas; Tasmania; New Zealand. Gregarious and timid; feeds on cuttle-fish.

Genus Delphinus.

Beak long and narrow. Forehead rounded. Teeth, 40 to 60 in each jaw, small, close set. Flippers pointed, shorter than the gape. Cosmopolitan.

The Dolphin.

Delphinus delphis.

Beak at least half the length of the gape. Black or dark brown above; sides, grey; beneath, white. Length, from 6 to 8, or even 10 feet.

As many as four species have been catalogued from Australia, but the differences are not great, and it is probably best, with Sir W. H. Flower, to consider them all as forms of a single widely-dispersed species.

Dolphins are generally to be seen in any trip to the Heads of either Port Phillip or Port Jackson, and are quite common all around our coasts. Everyone is familiar with their great speed and nimbleness in the water, tumbling and gambolling about the vessels while they are travelling at full speed, or turning aside to play a game of follow-my-leader. They keep in schools, and follow vigorously the shoals of herring and other fish on which they feed voraciously. They are generally called Porpoises, but we have no true Porpoise in Australian seas.

Genus Tursiops.

Form stout. Teeth about 25 in each jaw, stout. Flippers moderate, narrow.

The Southern Dolphin.

Tursiops catalania.

Light lead-colour above, paler below. Flippers with linear blotches of darker lead-colour. Length, 8 feet. Australia.

Genus Sotalia.

Teeth about 25 in each jaw, slender, conical. Flippers obliquely truncated.

Our single species, *S. gadamu*, is dark leaden grey above, almost black on the flippers, pinkish-grey below, and is about seven feet long. It occurs in the Indian Ocean and is met with off the Western Australian coasts.

ORDER SIRENIA.

Aquatic animals with long bodies adapted for swimming; no hind limbs; a horizontal tail fin, but no dorsal fin; skin thick; mammæ thoracic.

Genus Halicore.

Both jaws bent downwards in front; two incisors, those of the male tusk-like with bevelled cutting edges, those of the female not penetrating the gum; molars developed in succession, not more than three in use at the same time. Tail-fin crescent-shaped.

The Dugong.

Halicore dugong.

Skin, thick and smooth, with a few scattered hairs. Upper lip large, thick and bristly. Flippers, short, thick and fleshy. Slaty or brownish-black above, whitish below. Length, 8 feet. Shores of the Indian Ocean, Malay Archipelago, and Northern Australia, on the East as far south as Moreton Bay.

Ungainly creatures with small brains and very limited intelligence, hence too easily captured or destroyed, and now greatly thinned in numbers. In some cases the flesh is eaten, but the chief value lies in the oil, which is obtained from the layer of blubber beneath the skin, and which is very highly thought of, being free from odour and a good substitute for cod-liver oil. The Dugong feeds entirely on sea-weeds and marine phanerogams. It does not leave the water to browse on the land herbage, as it is quite unadapted for travelling on the land, having no hind limbs and very weak fore-limbs.

The Dugong is the original of the Mermaid. The females are gentle and affectionate to their young, and have the habit of sitting up in the water to suckle them, holding the calf to the breast by the flipper, with an almost human attitude and expression. Hence the stories, magnified in the forecastle, of the beautiful maiden with the fish's tail.

The following interesting account is given by Mr. A. H. E. Mattingley in the *Victorian Naturalist*:—

''One of the methods adopted by the natives for their capture is when they discover where the Dugongs come to browse on the sea-grass, which grows on the mud-banks near the shore, to erect a staging on which to stand, and then on moonlight nights to take up their position on the staging with a harpoon and coil of rope. The harpoon consists of a long pole with a hollow in one end, into which is fitted a wooden head, which is attached to the middle of a pole by a grass rope. Upon espying a Dugong they plunge the harpoon into it, whereupon the animal immediately rushes off; the harpoon head becomes dislodged from the pole, but being tied to the pole at its centre, retards very effectively the animal's progress through the water. The native paddles after it in his canoe, waiting till the animal becomes exhausted before finally despatching it.

"Another method is to spear them from a canoe in the daytime as they are making their way to some feeding ground. The spear used for this purpose is composed of a light wooden shaft in which is imbedded a piece of sharpened fencing wire. This is easily plunged through their gutta-percha like hide, and, as the animal dashes off, the wire bends like a fish-hook, and tows the shaft or some other float behind, and is easily followed by the natives in the canoe. The spear thrust is, however, not sufficient to fatally injure the animal, and it is therefore necessary for the natives to kill it, which is done by suffocation. Being a mammal, it is necessary for the Dugong to come to the surface to breathe. One of the natives dives overboard, and endeavours to insert a wooden plug into the animal's nostrils, and so cause suffocation; failing this, they usually tie a rope round its tail, and drag it down under the surface of the water, and so drown it; in the event of both these methods failing, they spear it through the nostrils."

The white man's method is equally cruel, and as the cows are killed off in large numbers for the sake of the oil, unless adequate protection is enforced, it can only be a matter of time before the Dugong will be exterminated in Queensland. Bones of the Dugong were met with during the excavation of Shea's Creek, which runs into Botany Bay. Hence the animal must formerly have extended much further south than at present.

SUB-CLASS METATHERIA.

MARSUPIALS.

Viviparous; the mammæ inclosed in a permanent pouch, and provided with teats; the young born in such an immature state that they are attached to the teat by the mother, the milk being forced into the mouth by special muscles; the young carried in the pouch often for a considerable period; long epipubic ("marsupial") bones present; adults provided with teeth.

Sub-order *Diprotodontia*—Two long and powerful incisors in the lower jaw, one on each side.

Sub-order *Polyprotodontia*—Incisors numerous, four or five in the upper and three or four in the lower jaw, on each side.

Sub-order Diprotodontia.

Two long and powerful incisors in the lower jaw, one on each side. Feeding on roots, fruits, leaves or grass, rarely on insects or on honey.

Key to the Families.

1.	Limbs very unequal, the hind limbs much longer and stronger.	Macropodidæ.
	Limbs not very unequal.	2.
2.	Hallux not opposable to the other toes. Burrowers.	Phascolomyidæ.
	Hallux opposable to the other toes. Arboreal.	Phalangeridæ.

Family Macropodidæ.

Hind limbs much the longer, progression by hops. Fore-feet with five digits free; hind feet mostly with no hallux or great toe, the fourth toe very large with a strong straight claw, the fifth like it but smaller, and the second and third slender and united in a common skin. Pouch large, opening forwards.

Key to the Sub-families.

1.	Hallux present.	Hypsiprymnodontinæ.
	Hallux absent.	2.
2.	Canines well developed.	Potoroinæ.
	Canines generally minute or wanting.	Macropodinæ.

Sub-family Hypsiprymnodontinæ.

Size very small. Claws small, feeble and subequal. Hallux present, opposable. Tail naked and scaly.

Genus Hypsiprymnodon.

Form rat-like. Limbs nearly equal, not adapted for hopping, hind foot with a long opposable clawless hallux. Nose and ears naked. Tail only hairy at the extreme base. Queensland.

The Australian Musk Rat.

Hypsiprymnodon moschatus.

A slender and graceful little creature which connects the Leaping and the Climbing Diprotodonts in an interesting way, while the naked ears and toes and the scaly tail are analogous to those of the Rats. The fur is close, crisp, and velvety, orange-grey in colour, the orange most pronounced on the back. Mr. Ramsay, who first described it, says that it frequents the dense and damp portions of the scrub (jungle) which fringes the rivers and clothes the sides of the Coast Range. Its habits are diurnal, and it procures its food by turning over the decaying vegetation in search of insects and worms and by digging for tuberous roots, frequently eating the palm fruits, which it holds with its fore paws after the manner of the Opossums. It may use the hallux in climbing about the underscrub. Two young have been found in the pouch. It possesses a remarkable odour of musk.

Head and body about ten inches; tail about six and a half inches. Herbert River District, Queensland.

Sub-family Potoroinae.

Size small. Claws of fore-paws very large, those of the three median fingers much larger than those of the outer. No hallux. Tail long and hairy. Canines well developed.

Key to the Genera.

1.	Tail crested, prehensile.	Bettongia.
	Tail not crested, not prehensile.	2
2.	Ears rather long.	Æpyprymnus.
	Ears short and rounded.	3
3.	Hind foot shorter than the head.	Potorous.
	Hind foot longer than the head.	Caloprymnus.

Genus Potorous.

Head rat-like. Muffle (the tip of the nose) naked. Ears short and rounded. Hind limb not disproportionately longer than the fore limb. Hind feet shorter than the head. Tail hairy, without trace of crest.

There are three species of the Potoroos, the most familiar being the Common Rat-Kangaroo, *Potorous tridactylus*, which extends over South Australia, New South Wales, Victoria, and

Tasmania. The head and body are about sixteen and a half inches long, and the tail about nine inches. It is greyish-brown above and greyish-white below. The Western species *P. gilberti* and *P. platyops* are very similar but rather smaller. The face of *P. platyops* is very short and broad, while in the others the face is long and narrow.

These animals are of about the same size as the Rabbit, and in the undisturbed economy of the Bush, play much the same part as the Rabbit does in England, while the part of the Hare is taken by some of the smaller Wallabies. They come out in the evening to nibble at the grasses and roots, spending the heat of the day in nests made of grasses, or on a "seat," placed under cover among the bushes.

Genus Caloprymnus.

Head rat-like. Muffle naked. Ears short and rounded. Hind feet longer than the head. Tail, short-haired, without trace of crest.

The Plain Rat-Kangaroo, *Caloprymnus campestris,* is somewhat larger than the Potoroos, the head and body eighteen inches, and the tail about fourteen inches. It is a slenderly-built animal, of a grizzled sandy colour above, brightest on the sides and limbs, pale sandy-white below, with white paws. There is a bare patch in the centre of the chest. Plains of South Australia.

Genus Bettongia.

Head rat-like. Muffle naked. Ears very short and rounded. Tail more or less prehensile, hairy, with a more or less distinct crest.

The Bettongs are remarkable amongst ground mammals as being the only ones known to possess a prehensile tail. The tail is employed for seizing and carrying the grasses with which the animal makes its nest. A hollow is scooped out in the ground, and the entrance, being thus on a level with the surrounding herbage, is closed up by grass, which the Bettong drags after it, and in consequence it is a difficult matter to detect the cunningly concealed lair.

As might be expected, the tail in the Bettongs is relatively longer than in the Potoroos. The development of the crest is greatest in the Brush-tailed Bettong, *B. penicillata*, which spreads over all Australia, except the extreme North. It is smaller than the other species, the head and body about fourteen inches, and the tail twelve inches. *B. cuniculus*, the Tasmanian Bettong, is larger, the head and body eighteen, and the tail fifteen inches. Lesueur's Bettong, *B. lesueurii*, is about as large as the Tasmanian, but the tail is shorter, only twelve inches; it is found in West and South Australia. Gaimard's Bettong, *B. gaimardi*, is more woolly than the others; it is intermediate in size, and is only recorded from New South Wales. All are grey in general colour; the feet in the Tasmanian species being white, in the others brownish, though the hind paws in Gaimard's are white.

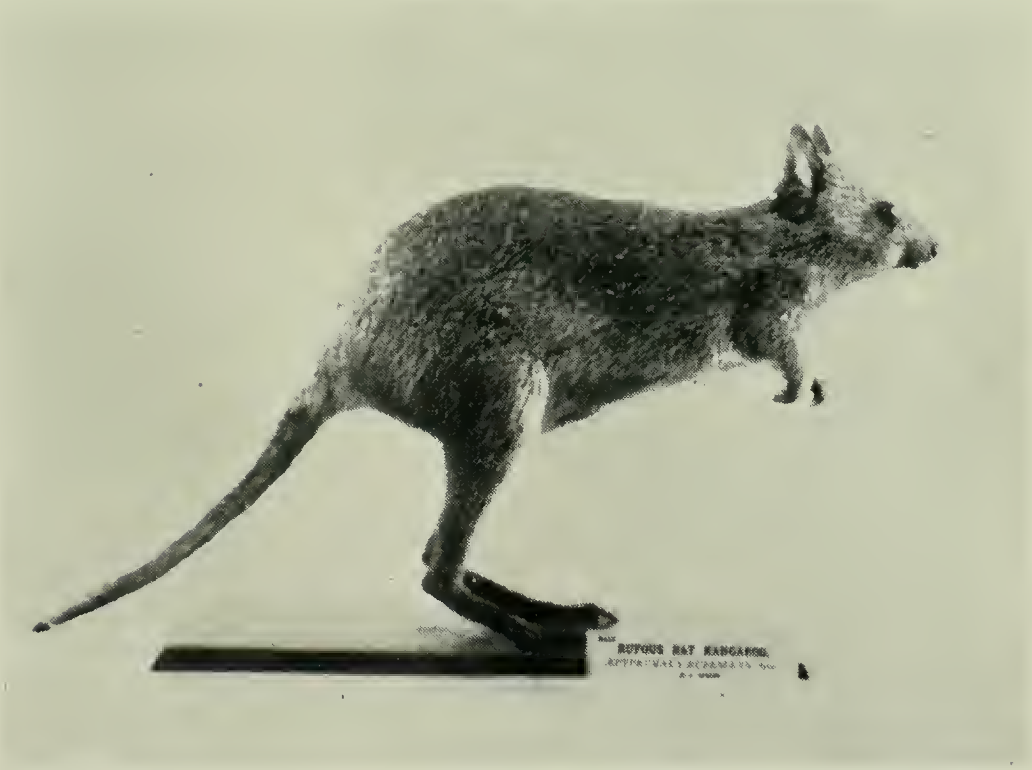
From life. *Melb. Zoo.*

Brush-tailed Rat-Kangaroo.

Genus Æpyprymnus.

Head rat-like. Muffle half hairy. Ears rather long. Hind limbs much longer than the fore. Tail, evenly hairy, without trace of crest.

In size and habit this Rat-Kangaroo approaches more nearly than others to the Wallabies, but is allied to the other Rat-Kangaroos by the three long strong claws of the fore limb. It lies curled up in its nest during the day, and in the dusk hops around its grazing ground. The head and body are about twenty-one inches long, and the tail fifteen inches. The fur is long and coarse, reddish-gray above and dirty white beneath; an indistinct white stripe across the sides in front of the hips. The tail is thickly hairy, wallaby-like, and there is no crest. The one species, *Aepyprymnus rufescens,* the Rufous Rat-Kangaroo, is confined to the State of New South Wales, where it is quite common.



Austr. Mus.

Rufous Rat-Kangaroo.

Sub-family Macropodinae.

Size, small to large. Claws of fore-paws moderate, sub-equal. No hallux. Tail long and hairy. Canines usually minute or absent.

This sub-family comprises the largest of the Marsupials, and those which are most specialized for grazing. They take the place in Australia of the hares and the deer and antelopes of the other continents. They are all saltatorial except the Tree-Kangaroos. They progress, when not feeding, by a succession of leaps, like a bird hops, clearing rocks and bushes and other obstacles with ease, and the larger kinds covering much ground in each leap, so that they speedily traverse great distances, even in rough country. The hind limbs are very long and powerful, and as in most mammals of speed, there is a reduction in the number and corresponding increase in size of the toes employed. There is no hallux, or "great toe" in one sense, and the second and third toes are small and slender, and united in a common integument, as if one put two of one's fingers in one finger of a glove: the fourth toe is enormously long and strong, and the fifth is like it but smaller. While feeding the animal makes use of the fore paws to assist it in moving along.

The nails or claws of the fore paws are moderate in size in comparison with that of the animal and those of the hind feet, but in the larger Kangaroos are sufficiently formidable. Tame Kangaroos have often been taught to box, and they take very kindly to the teaching, and it is not always the man who comes off the best in the bout. The fore paws are more legitimately employed by the females in clasping the young joey and casting it when pursued into a place of security amongst the thick bushes, and by the male, when chased by dogs, in seizing a pursuer, and after bounding to a waterhole or creek, holding the dog under the water, and pressing it down by the weight of the chest until it is drowned. An "old man" Kangaroo is indeed a dangerous fellow to tackle, as if brought to bay he fights with a will, hugging his opponent like a bear, and ripping him open with the long straight bayonet-like claw of the hind foot. A few days ago the body of a large Kangaroo was brought into the Australian Museum. With a number of others it had been kept in a small paddock in one of the Sydney suburbs. A pony was placed in the same paddock, and apparently made friends with the marsupials. One night, however, from some cause, the Kangaroo and the pony had a difference of opinion—perhaps horseplay turned to a free fight—but the result was that the Kangaroo was killed by a kick on the chest, and the pony was so badly cut up that the owner was compelled to shoot it in the morning.

The large tail is employed as a third limb to the tripod when the animal is sitting up at rest, and as a counterpoise to the fore part of the body when in rapid advance, and at such time does not touch the ground. In the Kangaroo proper it is thick and muscular at the base, and gradually tapers to the extremity. It is the part most favoured in the cuisine, as, like ox-tail, it makes an excellent soup.

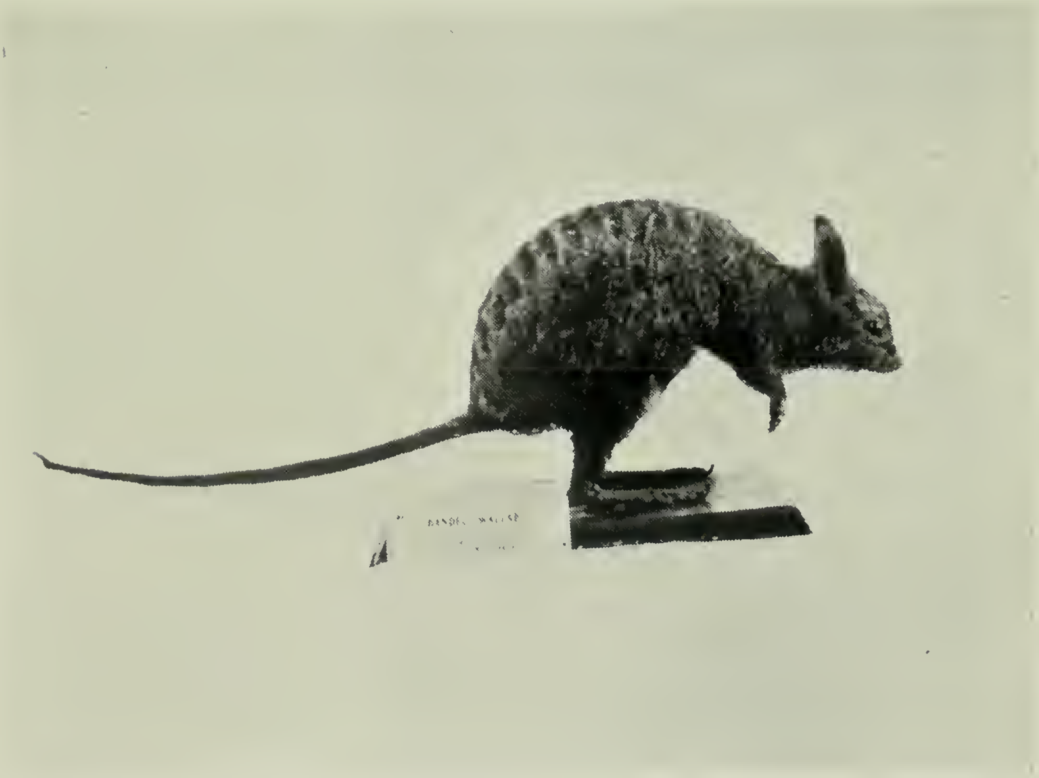
The brain is smooth, and the animals manifest no great evidences of intelligence. Still they manage their own affairs in general with success. It takes some time for them to become accustomed to fresh conditions, but they can learn by experience. Thus for long the wire fences of the stations puzzled them. Unable when at full speed to see the wires, the abrupt check, sometimes fatal, always unpleasant, came to be dreaded. The sight then of rows of posts has led them always to prepare for jumping so as to avoid the wires. So well has the lesson been learnt that often, when the fences have fallen into disuse, and the wires are wanting, the presence of the posts is sufficient to make a whole herd of Kangaroos leap high over the place where the wires used to be.

The Kangaroos and Wallabies, if captured when young, will become very tame and trustful. At Newington College a Wallaby and another large Kangaroo took great interest in the football matches, and at all times hopped about the grounds amongst the boys at play, without fear and without molestation. As one instance out of many of their excellence as pets, I may quote "Wanderer," who says: "While in Queensland the blacks brought my wife a piccaninny Kangaroo, and as she is very fond of pets she took great trouble in rearing it, which is rather difficult to do successfully. However, she accomplished the task, and was repaid by having one of the nicest, gentlest, and most lovable and loving pets possible to find. It used to come to table at every meal, and would sit beside her on the floor, take tea out of a saucer, eat bread or cakes, and behave in every way as well as any human could. When my wife went to visit her neighbours it always accompanied her. On one occasion it went with her to a picnic party in the wild bush, and during the day saw many of its own species, looked at them in a dreamy sort of way, sat down by its mistress's side, ate its food as usual, and did not seem at all put out by its wild kinsfolk. Joey, as he was called, had a habit, whenever he could get the chance, of taking my wife's hand between his fore-paws and stroking and fondling it.'' As is too often the case, Joey met with a violent death, being caught and destroyed by Kangaroo dogs.

As the habits of the Kangaroo are diurnal, and as there is a distinct element of danger, a Kangaroo-hunt affords the best kind of sport to be had in Australia. They are hunted by a mounted party provided with large specially-trained Kangaroo dogs. An old man Kangaroo will frequently escape even from this combination, especially on hot days when his great powers of endurance tell. At first he will easily outstrip the horses and the dogs, but the pace gradually telling, he may be overtaken and brought to bay. Three or more dogs are needed to bring him down, one drawing the Kangaroo while the others spring on him and kill him, but not infrequently there will be a dog or more remaining on the field of battle.

The young are born in a very immature state, and are transferred by the mother, who uses her lips for the purpose, to the pouch, where she attaches the little embryo to the nipple. So closely does the tiny creature adhere to the teat that bushmen for generations have been persuaded that it originates there. It remains in the pouch for months, and even when able to leave the pouch and browze on the grass, will, if alarmed, at once take refuge in the familiar shelter. The females are in general much smaller than the males, and are less aggressive.

The Kangaroos and Wallabies are growing scarcer rapidly. Besides the hunters who pursue them for their skins, the squatter and the farmer have been allies in warfare against these nomad rangers. Both have considered that their interest demand the extermination of these aboriginal possessors of the land. The squatter has to protect his sheep from the competition of their unproductive rivals, and the young crops of the selector are laid waste by the Wallabies, and his labour lost. In all the States the war of extermination is going on. But has this wholesale destruction of the marsupials proved an unalloyed success? In many districts the slaughter of their natural prey has turned the attention of the dingo to the sheep, and when once a dingo has tasted sheep he is henceforth contemptuous of Kangaroo. Another evil has been ascribed in Queensland to the destruction of the Kangaroos. They were wont in past times to crop down the grass which grew in and about the patches of scrub where the sheep had not as yet penetrated. Now the grass grows and withers, and thus affords tinder for serious bush fires. Apart from the sentimental dislike to see these interesting animals likely to disappear from the continent, it may quite well be ultimately worth while to establish marsupial runs, and thus to secure a continual supply of the pelts, some of which make valuable leather and others are prized for the fur.



Austr. Mus.

Banded Hare-Wallaby.

Key to the Genera.

1. Fore limbs nearly as large as the hind limbs. Arboreal.	Dendrolagus.
Fore limbs much smaller than the hind limbs. Terrestrial.	2
2. Cross bands of colour on the back.	Lagostrophus.
No cross bands on the back.	3
3. Tail with spur or nail at the tip.	Onychogale.
Tail without spur or nail.	4
4. Muffle wholly or partly hairy.	Lagorchestes.
Muffle wholly or mainly naked.	5
5. Hind claw very short.	Petrogale.
Hind claw long.	Macropus.

Genus Lagostrophus.

Form kangaroo-like. Muffle naked. Hind feet, covered with long bristly hairs, hiding the claws. Cross bands of colour on the back.

The Banded Hare-Wallaby.

Lagostrophus fasciatus.

Form light and graceful. Fur thick and soft. Colour, grizzled brown above with a number of cross bands alternately black and white; below, mixed grey and white. Tail, uniformly clothed with close-set short hairs of a yellowish colour. Head and body, about eighteen inches; tail, about thirteen inches. West Australia.

Genus Dendrolagus.

Fore limbs stout and strong, nearly as large as the hind limbs. Muffle with short scattered hairs. Toes of hind limb not disproportionately unequal; the claws of the fourth and fifth curved like those on the hand. Fur on the nape of the neck directed forwards. Arboreal.

Lumholtz' Tree Kangaroo.

Dendrolagus lumholtzi.

Fur long and rather coarse. Face, black with a paler band across the forehead; ears black without, yellow within; back, grizzled grey in the females and young, yellowish-brown in the males, sides and belly pale yellowish-white; chin black, chest white; limbs yellowish; paws black; tail, the upper side the paler. Head and body about twenty-six inches; tail about as long. Herbert River district, Queensland.

Lumholtz heard of the existence of Tree Kangaroos in North Queensland from the blacks. At last they brought him in a specimen. He writes: "I had just eaten my dinner, and was enjoying the shade in my hut, while my men were lying round smoking their pipes, when there was suddenly heard a shout from the camp of the natives. My companions rose, turned their faces toward the mountain, and shouted, *Boongarry, boongarry!* A few black men were seen coming out of the woods and down the green slope as fast as their legs could carry them. One of them had a large dark animal on his back.

"Was it truly a boongarry? I soon caught sight of the dog Balnglan running in advance, and followed by Nilgora, a tall powerful man. The dark animal was thrown on the ground at my feet, but none of the blacks spoke a word. They simply stood waiting for presents from me.

"At last then I had a boongarry, which I had been seeking so long. It is not necessary to describe my joy at having this animal, hitherto a stranger to science, at my feet. Of course I did not forget the natives who had brought to me so great a prize. To Nilgora I gave a shirt, to the man who had carried the boongarry, a handkerchief, and to all, food. Nor did I omit to distribute tobacco.

"I at once saw that it was a Tree-kangaroo. It was very large, but still I had expected to find a still larger animal, for according to the statements of the natives, a full-grown specimen was larger than a wallaby. This one proved to be a young male.

"Upon the whole the Boongarry is the most beautiful mammal I have seen in Australia. It is more variegated than those species which are found in New Guinea. It goes out only in the night. During the day it sleeps in the trees, and feeds on the leaves. It is able to jump down from a great height, and can run fast on the ground. During rainy weather the Boongarry prefers the young low trees, and always frequents the most rocky and inaccessible localities. It always stays near the summit of the mountains, and frequently far from water, and hence the natives assured me that it never went down to drink.

"During the hot season it is much bothered with flies, and then it is discovered by the natives by the sound of the blow by which it kills the fly. In the night, they say, the Boongarry can be heard walking in the trees."

Bennett's Tree Kangaroo.

Dendrolagus bennettianus.

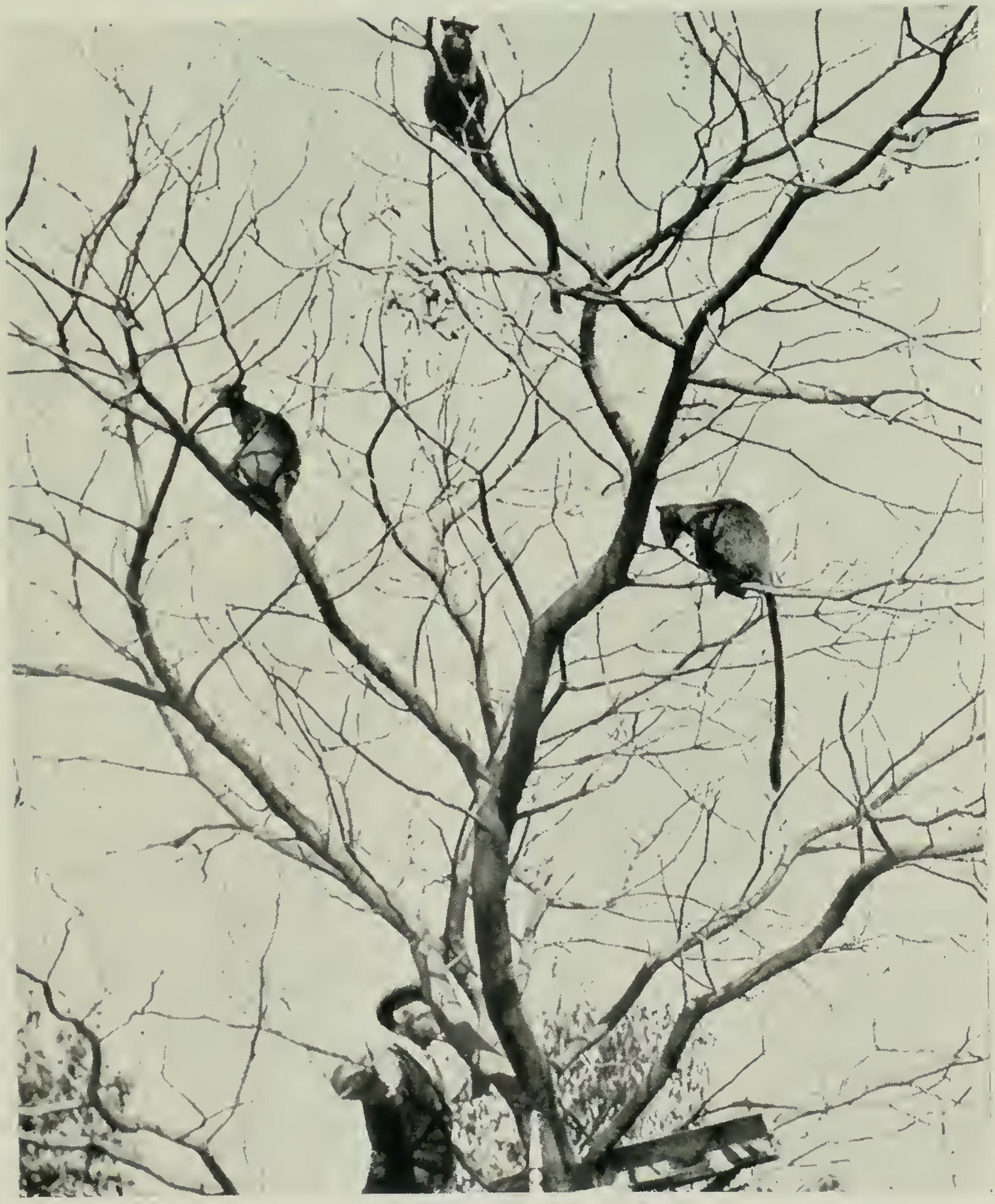
Fur soft and long. The hair radiates from a point some distance behind the shoulders, whence it is directed upwards to the head. Face, grey, passing into chestnut and rufous on the head; upper surface of body dark warm brown, black around the point of radiation of the fur, and generally dark on the midline; throat red, sides chestnut, lower surface darker from the chest to the pouch, rusty and lighter behind; tail, above in succession reddish-brown, black, light rufous-brown, with a black tip, and the under surface is black throughout its length. Head and body of an adult female, about twenty-four and a half inches; tail, rather longer. Bloomfield River, North Queensland.

Mr. E. R. Waite, from whom the above description is taken, is quite satisfied from skeletal and other details that Bennett's Dendrolagus is a distinct species. In his paper he gives a number of interesting details as to the habits of the animal, quoting Messrs. D. Le Souëf, R. Grant, and George Hislop, who have observed the animal in its haunts.

Some years ago some sixteen individuals were obtained in the Bloomfield district alive for the Melbourne Zoological Gardens, and shipped at Cooktown in eight cages. While on board one of the smaller animals escaped from its cage and immediately jumped into the rigging, up which it went with amazing speed, and seemed perfectly in its element when in the vicinity of the mast-head. During the voyage they were fed upon milk and unripe bananas. While in daylight they seemed inclined to sleep; in this condition the body is bent forward until the snout is almost between the thighs, the fore paws being placer close to the cheeks. Normally the ears have a horizontal aspect, but are drooped somewhat during sleep. When the animal is alarmed they are suddenly pricked, but never pressed backwards; in this respect they resemble the Phalangers.

There is very little indication of a crest where the hair of the head and of the back meet. When at rest the tail was usually passed under the body and carried in front. The habit explains the unusual distribution of colour on the tail, the under surface being black and the upper lighter. A similar colouring is met with in some of the Lemurs which sleep with their tails beneath them.

They live on the bird's-nest fern, climbers, and wild fruits, and are eminently arboreal. They can make great leaps to the ground, from heights of thirty or even sixty feet, alighting like a cat upon their feet, and without hurting themselves at all.



From life. *Melb. Zool. Gard.*

Bennett's Tree Kangaroo.

The vegetation at the altitudes which they frequent is almost invariably enveloped in moisture all night, just at the time when the animals are out feeding on it, so that they obtain probably nearly all the water they need with their food. In captivity they will drink large quantities of water.

The males are very pugnacious, and if two of them be placed in an enclosure together they will often fight until one is killed. They spar with the fore paws in quite a scientific manner, uttering grunts all the time, till one sees an opportunity of closing with the other, when he makes straight for the back of the neck, and if he succeeds in getting a grip with his teeth he shakes the other like a dog does a rat. Some of the old males have quite a harem, and keep their wives from straying, and do not let any other males go near them. Mr. Robert Hislop found several of these families numbering from three to five females and one male. They have only one young one at a birth, as is usual in Kangaroos.

The blacks find them by employing a dingo to follow the scent to the tree to which the animal has retired. Some of the blacks then climb the tree, and drive the animal down. It usually jumps to the ground, but will sometimes descend the trunk tail foremost. The poor beast is then usually caught by the dogs and despatched by blows on the head from a nulla nulla.

There are persistent rumours amongst the natives of the existence of a large tiger-cat as large as a bulldog, with brindled fur and very large eyes, which is said to spring on the Tree Kangaroo and crush the skull in its powerful jaws. The blacks are frightened of it, as they say that it does not hesitate to attack a man, and often kills their dogs. Seeing that the Boongarry was only made known to science in 1882, it is not improbable that a new carnivore will yet be discovered in the same wild country.

Genus Lagorchestes.

Form kangaroo-like. Muffle wholly or mainly hairy. Central hind claws long and strong, not hidden by the hair. Tail rather short without caudal spur.

The Rufous Hare-Wallaby.

Lagorchestes hirsutus.

Form light and slender. Muffle nearly wholly hairy. Ears long. Above, grizzled grey, redder behind; yellowish-grey below. No black patch on the elbow. Band round the eye slightly rufous. Tail, dull grizzled grey. Head and body, about eighteen inches; tail, about fifteen inches. West Australia.

The Common Hare-Wallaby.

Lagorchestes leporoides.

Very like the above, but with more yellow in the fur. A black patch on the elbow. A rufous band round the eye, prolonged forwards on the sides of the muzzle. Head and body, about twenty inches; tail, about thirteen inches. Interior of New South Wales and South Australia.

We may quote the well-known account given by Mr. Gould. "The name of Hare Kangaroo has been given to this species as much from the similarity of form and size to the common Hare as from its similarity of habits. I usually found it solitary, and sitting alone on a well-formed seat under the stalk of a tuft of grass on the open plains. For a short distance, its fleetness is beyond that of all others of its group that I have had an opportunity of coursing. Its powers of leaping are also equally extraordinary. While out on the plains of South Australia, I started a Hare Kangaroo before two fleet dogs. After running to the distance of a quarter of a mile, it suddenly doubled and came back to me, the dogs following close at its heels. I stood perfectly still, and the animal had arrived within twenty feet before it observed me, when, to my astonishment, instead of branching off to the right or to the left, it bounded clear over my head."

The Spectacled Hare-Wallaby.

Lagorchestes conspicillatus.

Form rather thick and heavy. Tip of the muffle naked. Ears short. Above grizzled yellowish grey; below, mixed white and slaty-grey. A well-defined chestnut band round the eye, not prolonged forwards on the sides of the muzzle; two whitish lateral bands. Head and body, about twenty inches; tail, about seventeen inches. Islands off the North-west coast of Australia.

In the continental form discovered by Leichhardt in the North the coloration is much more brilliant than in the island form. The red band round the eye is very bright, and the lateral bands and the undersides are nearly pure white. It has been named as a distinct species, *L. leichhardti.* One specimen of this variety was caught in a spring-trap at night in sandy country near Mount Sonder in Central Australia. It is apparently a solitary-living and nocturnal animal.

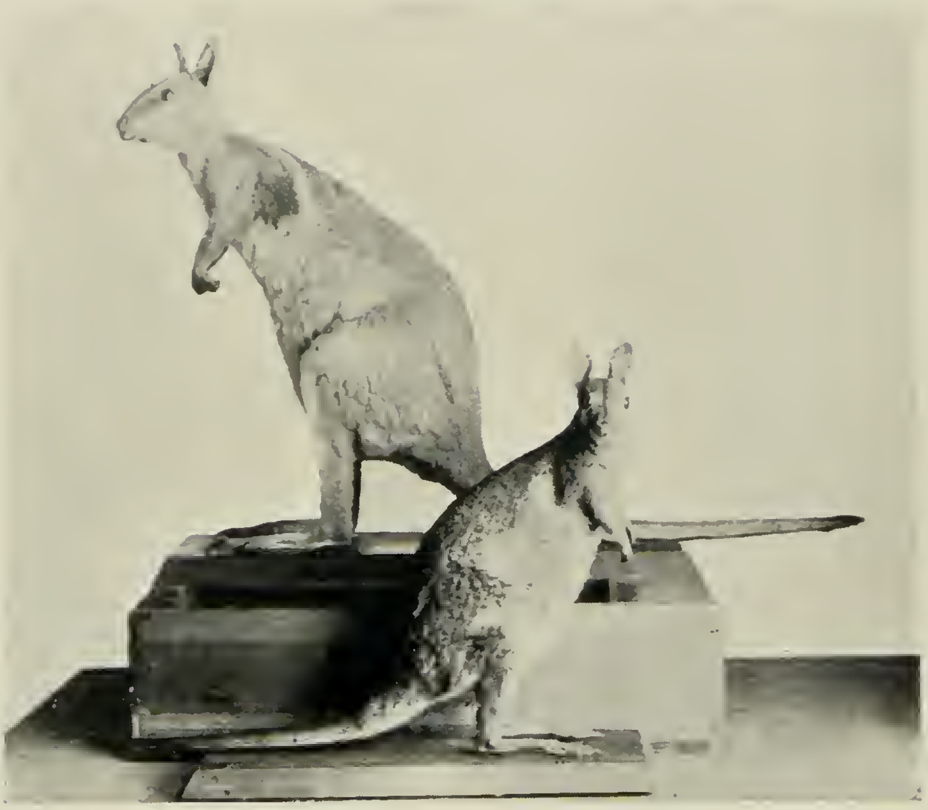
Genus Onychogale.

Form kangaroo-like. Muffle hairy. Central hind claw long, narrow, compressed and very sharp. Tail long, tapering, more or less crested towards the tip, which is provided with a spur or nail.

The Crescent Wallaby.

Onychogale lunata.

About the size of the Hare-Wallabies, form very light and delicate. Fur, soft and woolly. Above dark grey, below whitish; neck rich rufous; a prominent white shoulder-stripe, not continued along the back of the neck; two inconspicuous hip-stripes. Tail, short, uniform grey, the terminal nail consisting of a very short, rounded point. Head and body about twenty inches; tail thirteen inches. West and South Australia; extending to the Centre.



Macleay Mus.

Bridled Wallaby. Crescent Wallaby.

The Bridled Wallaby.

Onychogale frenata.

Form as in the preceding, but rather larger. Above clear grey, below the chin and chest white, the belly pale grey; the prominent white shoulder-stripe is continued along the back of the neck to just behind the ear; an inconspicuous thigh-stripe. Tail of moderate length, uniform grey, the tip black, and provided with a nail as in the preceding. Head and body about twenty-two inches; tail eighteen inches. Interior of Northern Queensland, New South Wales and Victoria.

The Nail-tailed Wallaby.

Onychogale unguifera.

Form light and slender but larger than in the other two species. Above rich sandy fawn with a darker median band; below white; no white shoulder-stripe, but the white hip-stripe present. Tail very long, white above, sandy-grey below, the terminal third with brown rings and a black tip; the terminal nail large and flattened laterally, hidden by a pencil of black hairs. Head and body about twenty-six inches; tail as long. North-western and northern Central Australia.

From life.

Bridled Wallaby.

Genus Petrogale.

Form, kangaroo-like. Muffle naked. Central hind claw very short. Tail cylindrical, thickly haired, its extremity pencilled.

The Rock-Wallabies are adapted to their different habitat by certain modifications in the kangaroo structure. The body is more compact. The tail is not thickened at the base, and is not used to support the weight, but only to assist the animal in balancing itself in its leaps. It is clothed with long hairs, which form quite a brush at its extremity. The feet are comparatively short, and the nails are short and do not project far in front of the toe. The toes are remarkably rough underneath, being thickly covered with small tubercles which prevent the animal from slipping. They live in caves and holes of the rocks during the day, and come out at night, swarming along in groups one after another, and jump from side to side, alighting on ledges so slightly prominent that their resting thereon seems an impossibility. Six species are described. They differ mainly in size and coloration.

The Little Rock Wallaby.

Petrogale concinna.

Size small; form slender. Ears very short. Fur short, soft and silky. General colour above rich orange rufous; below white or greyish. No special markings on face, shoulders or flanks. Dimensions not known, an immature male had the head and body about fourteen inches. North-west Australia.

The Plain-coloured Rock Wallaby.

Petrogale inornata.

Size medium; form slender. Ears very short. Above sandy-grey, below sandy-white. No special markings on face, shoulders, or flanks. Head and body about twenty-three inches; tail twelve inches. North Coast of Australia.

The Short-eared Rock Wallaby.

Petrogale brachyotis.

Size medium; form slender. Ears very short. Above greyish-fawn, below greyish-white. No special markings on the face; a dark brown patch behind the elbow, succeeded by a whitish band. Head and body about twenty-two inches; tail sixteen inches. North-west coasts of Australia.

The West Australian Rock Wallaby.

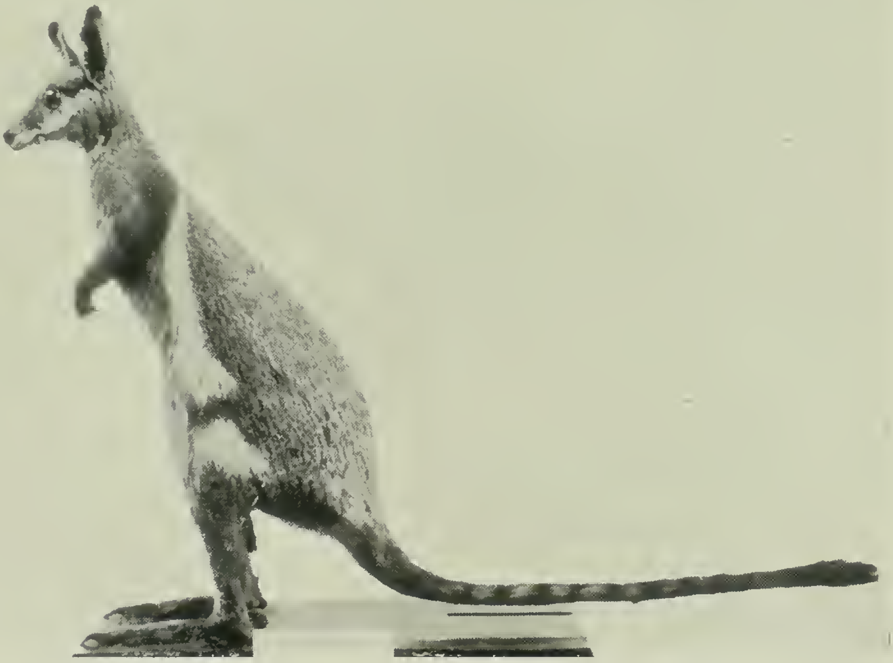
Petrogale lateralis.

Size medium; form slender. Ears short. Above light grey, below yellowish-grey. A dark white whisker mark with a whitish or yellowish cheek-stripe below. A narrow dark stripe from the head to the centre of the back. A brown or black mark behind the elbow, succeeded by a white stripe running to the hip. Head and body about twenty-four inches; tail seventeen inches. West Australia, and the common Rock-Wallaby of the Centre living among the rocks with the Euro.

The Brush-tailed Rock Wallaby.

Petrogale penicillata.

Size large; form stout and heavy. Fur, long, thick and coarse. Ears short. Above dull brown; below grey in front, yellowish brown behind. Whisker mark and cheek stripe ill-defined. A black mark behind the elbow, succeeded by a pale grey one, both often inconspicuous. Head and body about twenty-nine inches; tail twenty-three inches.



Austr. Mus.

Yellow-footed Rock Wallaby.

The Yellow-footed Rock Wallaby.

Petrogale xanthopus.

Size large, the largest of the genus; form of *Macropus*. Fur, long, soft and silky. Ears long. Above grey, below white. A well defined white cheek-stripe. A black streak from the head to the middle of the back. A brown blotch behind the elbow, succeeded by a white stripe running down to the hip. Top of knee brown with a white patch outside it. Tail above and on the sides with alternate rings of dark brown and pale yellow. Head and body about thirty-two inches; tail twenty-four inches. South Australia.

Genus Macropus.

Muffle naked. Ears well developed. Limbs very unequal, the hind much longer and stronger than the fore. Central hind claw long and projecting. Tail thick, tapering.

Of this dominant form of grass-eating Marsupials, spread all over Australia and Tasmania, in former days in countless multitudes, there are no fewer than twenty-one species recognized, while some of these show well-marked varieties. Occupying different stations, the open plains, the forests, and the dense scrub, and the rocky ravines of the mountain country, they are diversified in size and in colouring; some are slender and more graceful, others stouter and more robust, but all are at once recognizable by the familiar shape and mode of progression. The smaller species, under four feet in length of head and body, are generally called Wallabies, while the name Kangaroo is restricted to the larger kinds which stand over four feet in height. We thus number fifteen kinds of Wallaby and six of large Kangaroos.

The Short-tailed Wallaby.

Macropus brachyurus.

This is the smallest of the Wallabies, with a short squat form. Ears very short and rounded. Grizzled grey-brown above, slaty-grey below. Tail very short. Head and body about twenty-three inches; tail ten inches. West Australia.

The Rufous-bellied Wallaby.

Macropus billardieri.

Another stout and heavy small Wallaby. Ears very short. Greyish-brown above with an olive tinge, below yellow, orange, or rufous. Tail very short. Head and body about twenty-six inches; tail fourteen inches. A Southern form, Victoria and adjacent part of South Australia, the islands of Bass Strait and Tasmania.

They live in the thick scrub, making tracks or runs through it. They are much sought after for their skins, and are generally caught by the aid of dogs. In the islands the hunters often set fire to a patch of scrub, and as the Wallabies run out they are killed by the dogs or shot. In the early days the islands simply swarmed with Wallabies, as there was plenty of feed, and there were no rivals or enemies.

The Pademelon.

Macropus thetidis.

A very light and graceful little Wallaby. Ears long. Above grey, the neck rufous, below white. Sometimes a faint light hip-stripe. Head and body about twenty-five inches; tail sixteen inches. An Eastern species, ranging from Victoria through New South Wales to Southern Queensland.

Other small Wallabies are *M. eugenii* in the West; the White-throated Wallaby, *M. parma*, of New South Wales; the Branded Wallaby, *M. stigmaticus*, of North-east Queensland, which has a very prominent yellowish hip-stripe; the Red-legged Wallaby, *M. wilcoxi*, of New South Wales and South Queensland, with rusty-red legs; and the Cape York Wallaby, *M. coxeni*, of Northern Queensland, with a well-marked white hip-stripe.

From life.

Albino Rufous-bellied Wallaby.

The Agile Wallaby.

Macropus agilis.

A rather stout and heavy large Wallaby. Ears very short. Sandy above, whitish below. An ill-defined dark stripe on the nape. A dark brown mark from the nape to behind the elbow. A well-marked white hip-stripe. Head and body about thirty-seven inches; tail thirty-four inches. Northern Territory, North Queensland, and South-eastern New Guinea.

The Black-tailed Wallaby.

Macropus ualabatus.

A rather large Wallaby of stout build. Fur long thick and rather coarse. Ears short. Above dark reddish-grey; below pale rufous or yellow. Tail black. Head and body about thirty-three inches; tail twenty-six inches. Coast regions of New South Wales and Victoria.

It is only found in densely timbered country, and remains in the thickest cover in the day time, coming out to feed in the evening. The dark colour is doubtless in accordance with the shade of the forest and the crepuscular activity of the animal, making it more difficult to be seen by its enemies. The Black Wallaby, as it is sometimes called, is perhaps the least active of its class, being heavy and comparatively sluggish in its movements.

From life. *Sydney Zoo.*

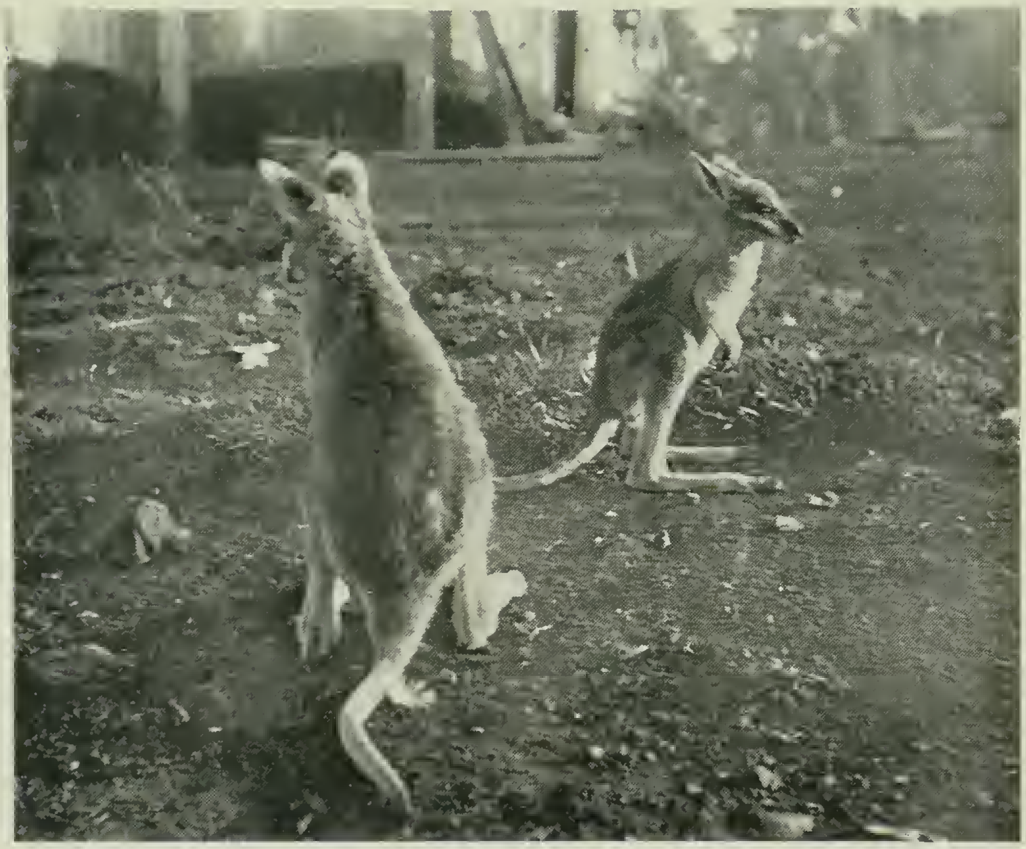
Agile Wallaby and Pademelon.

The Red-necked Wallaby.

Macropus ruficollis.

The largest of the Wallabies, of slender form. Ears long. Above greyish-fawn, the back of the neck and the rump bright rufous; below greyish-white. Face-markings inconspicuous. Head and body about forty-two inches; tail thirty inches. Eastern Australia from Southern Queensland to Victoria.

The Tasmanian variety, Bennett's Wallaby, has longer and thicker fur in accordance with the colder and wetter climate, and is darker and more sombre in its colouring. This form is met with in the larger islands of the Strait and in Southern Victoria, but the typical Red-necked Wallaby is not found off the mainland. Bennett's Wallaby is hunted for the valuable skins, and the numbers are much reduced, so that the animal is now rare, especially in the islands, where it was formerly plentiful. The Red-necked is still fairly abundant in New South Wales, living in rough rocky and open-timbered country.



From life. *A. R. McCulloch.*

Parry's Wallaby.

The Black-striped Wallaby.

Macropus dorsalis.

A rather large, light and delicate Wallaby. Ears long. Above grey, below greyish-white. Without face markings. A conspicuous black band runs from the head to the middle of the back. Head and body about thirty-two inches; tail twenty-four inches. Interior of New South Wales and Queensland.

Grey's Wallaby.

Macropus greyi.

A rather large, elegant Wallaby. Ears long. Greyish-fawn above, redder on the back of the neck; below pale reddish grey. There are distinct face-markings; a black band borders the muffle; a black whisker-mark, bordered below by a white cheek-stripe, which reaches nearly to the ear. A light indistinct hip-stripe. Head and body about thirty-two inches; tail twenty-nine inches. South-eastern and South Australia.

From life. *Melb. Zoo.*

Parry's Wallaby.

The Black-gloved Wallaby.

Macropus irma.

A fairly large Wallaby; slender and graceful in form. Ears long. Fur thick and soft. Above dark bluish-grey; below yellowish-grey. Two dark whisker-marks; a yellow cheek-stripe, continued backwards to the ear. A pale inconspicuous hip-stripe. Tail with a well-defined crest of stiff black hairs. Fingers and toes pure black. Head and body about thirty-one inches; tail twenty-nine inches. Southern parts of West Australia.

Parry's Wallaby.

Macropus parryi.

A large Wallaby, slender and graceful. Ears long. Fur soft, almost woolly. Clear bluish-grey above; below chin white, the rest greyish-white. Two dark whisker-marks. Cheek-stripe pure white, passing backwards to beneath the eye. A white stripe on the neck, edged with dark on each side. Head and body about thirty-seven inches; tail thirty-two inches. Mountain Ranges of New South Wales and Queensland. They live in the open forest, and grow very tame in confinement.

Apart from Owen's Kangaroo, *M. magnus,* which is only known by a skull from the Northern Territory, and the foxy-red *M. isabellinus,* from the North-west and adjacent islands, and about which very little is known, there are four well-defined species of Kangaroo, all of which stand over five feet in height.

From life. *Sydney Zoo.*

Great Red Kangaroo.

The Great Red Kangaroo.

Macropus rufus.

Form robust, slender in the female. Fur short, close and woolly. Males brilliant rufous above, females slaty-grey; below pale grey with the fur coarse and straight. A black whisker-mark with a white blotch below it. Tail grey. Head and body about sixty-five inches; tail, forty-two inches. Central Australia, and the inland plains of the South-east and East.

The Red Kangaroo is the largest living species. It is found in the plains of the Murray basin, but is now rare, having been sadly diminished in numbers by man, dogs, and drought. It is noted for its speed; the female was called the Flying Doe.

The animal was met with by the members of the Horn Expedition. They saw it frequently in small numbers throughout all the plain districts, says Spencer, just as the Euro (*M. robustus*) is met with amongst the ranges. "We never saw more than ten or twelve feeding together; amongst these would be two or three large rufous-coloured males, while the rest would be smaller blue-grey females and young ones. It was seen everywhere in the plains from Mount Olga to north of the Macdonnell Ranges. At Mount Olga we were not very far away from West Australia, and the same class of country stretches right across into the latter. As this is the characteristic Kangaroo of this country, there can be no doubt whatever that it ranges into the

From life. *Sydney Zoo.* *George, Photo.*

Red Kangaroo--Male, Female, Young in pouch.
Wallaroo in background.

inland parts of West Australia." The numbers in which it is met with in the Central plains doubtless depend upon the seasons and the amount of food available. The animal is capable of long journeys, being endowed with great strength and endurance, and chooses its station according to the food-supply. The red colour of the males harmonises well with the desert hues, the blue of the female is less apparently advantageous.

From life. *Sydney Zoo.*

Antilopine Kangaroo.

The Wallaroo or Euro.

Macropus robustus.

Form stout and heavy. Fur of medium length, rather thick and coarse. Above dark smoky-brown; below lighter. Nose and back of the ears nearly black. Central hind toe very short. Head and body about sixty inches; tail thirty-six inches. Inland ranges of New South Wales and Queensland, and of the Centre, probably also of West Australia.

The Central and South Australian Euros are more rufous, while the Wallaroo of Queensland is blacker, but there appears to be no structural distinction between the two. Both forms are confined to the rocky hills and are never met with in the plain country occupied by the Red Kangaroo. The old male Wallaroos are nearly black. The fore limbs are stronger than in the Grey Kangaroo, and the animal is more formidable. It is said that it will seize a pursuing dog and force it over the rocks.

M. antilopinus is a rather smaller but similarly stout and short-toed species found in the Northern Territory. Rich rufous above; whitish below. Head and body fifty-six inches; tail thirty-six inches.

The Common or Great Grey Kangaroo.

Macropus giganteus.

Form robust. Fur short, close and rather woolly. Greyish-brown above, whitish below. Central hind claw long and strong. Head and body about sixty inches; tail thirty-seven inches. All Australia except the Centre and the extreme North.

The Western Kangaroos are darker in colour than the Eastern. Occasional instances of melanism and of albinism are met with. An albino female in the Melbourne Zoological Gardens used to produce a white young one every year. The tail does not touch the ground when the animals are leaping, but when they are feeding and moving slowly they rest their weight upon it, while they move their feet. When they are fighting, says Mr. Le Souëf, they stand on their toes, and lean back on the end of the tail; and when they kick forward, the whole of the weight of the body is supported by the tail. Mr. Le Souëf measured the distance covered by a female going at top speed down a slight incline, and found it to be twenty-five feet. An old man Kangaroo would clear considerably more.

The Tasmanian variety had much longer, coarser, and darker fur, but the belly pure white. It is now practically extinct.

The Black-faced variety is smaller, of lighter build, and darker colour. A brown patch on the face connects two dark whisker-marks. It is found in the Mallee (dwarf Eucalypti) country of Southern Australia.

Family Phalangeridae.

All the feet with five digits; those of the fore limb generally subequal; of the hind limb the second and third in one integument (syndactylous), the fourth the longest, the fifth but little smaller, hallux present, widely opposable to the other toes, with a broad, nailless terminal pad. Tail, except in the Native Bear, very long and almost always prehensile. Pouch well developed, opening backwards.

Key to the Sub-families.

1. No tail.	Phascolarctinæ.
Tail long, usually prehensile.	
2. Muzzle short and broad, tongue not extensile.	Phalangerinæ.
Muzzle long and slender, tongue extensile.	Tarsipedinæ.

The Sub-family *Phascolarctinae* only includes the Native Bear, and the characters are thus the same as for the genus *Phascolarctus.*

Genus Phascolarctus.

Form sloth-like, stout and clumsy, without tail. Muzzle short and broad, the tongue not extensile. Cheek pouches are present. Ears large, thickly furred. Fur thick and woolly. Fore toes subequal, the first and second opposable to the others, thus both hands and feet are clasping. Teeth large. Arboreal. Eastern Australia.

The Koala or Native Bear.

Phascolarctus cinereus.

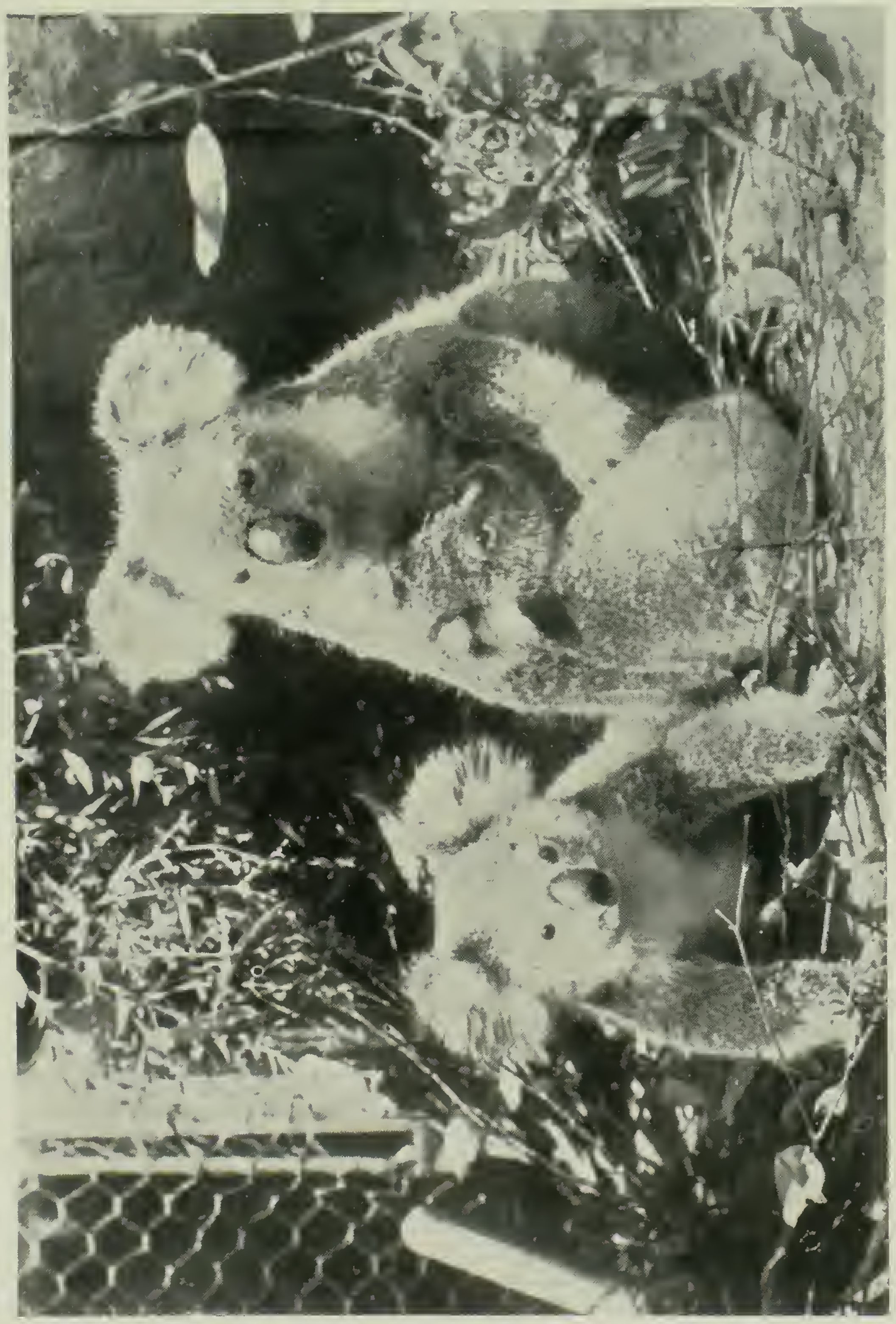
General colour grey, lighter on the chest. Muzzle black. Ears rounded, the hairs on the outside black, tipped with white. Head and body about thirty-two inches. Eastern Australia.

The Native Bear is surely the mildest, simplest, and most unsuspecting of our native mammals. I shall not easily forget when I was fresh from England, and rambling alone in the Gippsland forest. I turned around and, to my surprise, saw suddenly an uncanny creature with big hairy ears and grave-looking eyes gazing at me from a low stump at the distance of a few feet. In England one does not see wild animals of such a size, and I had to rub my eyes before I could believe in the reality of the vision. I was fortunate in getting a close view of the Bear, and view him I did to my heart's content, while he also seemed interested in an unimpassioned sort of way in the new chum.

It is almost impossible to catch in a drawing the peculiar weird, droll expression of the Bear. It is very sleepy during the day, but at night moves about a little briskly, the male grunting vigorously as it climbs to the top of the very highest trees, where it pastures on the young and tender gum-leaves. It uses its fore paws to lay hold of the twigs and bring them to its mouth. When in captivity it laps like a dog when drinking. The fur is usually redolent of eucalyptus, and fortunately is not valued in the market.

It is singularly inoffensive, and anyone who would wantonly shoot a Bear in cold blood would probably feel at home with a gun among a flock of sheep. As pets they become very tame, are easily supplied with food, and possess a passion, or at least an instinct, for alpine climbing on to one's shoulders, their upward progress being very deliberate, and with a pensive look always on their faces. One notices in this way that the claws are long and sharp, and when once they have taken hold they are somewhat difficult to dispossess. When shot on the tree, they frequently hold on with their claws so firmly that the body does not fall to the ground, and the would-be sportsman does not secure his quarry.

From life. *Jago.*
Young Native Bear.



From life.

Native Bear Group.

National Park, N.S.W.

It will descend from the trees on occasion and crawl on the ground on all fours in search of edible vegetation. The animals are found in pairs, but in the undisturbed forest, large numbers will keep you awake with their discordant grunting, as you lie listening to them in your camp. The female produces one cub, and the little one soon learns to cling tightly to the back of the mother, who carries it about with her as she climbs.

Sub-family Phalangerinae.

The Australian Opossums.

Muzzle short and broad. Tongue not extensile. No cheek-pouches. Tail long and usually prehensile. Teeth well developed, but the diprotodont character not always completely established.

The name "Opossum" applied to these animals is really a misnomer, for they are very widely different in structure and in habits from the American *Didelphidae*, to which the name was first applied. The true American Opossums are a carnivorous, polyprotodont family. They have long pointed muzzles, short legs, and scaly tails like the Rat. Some have no pouch, and the young are carried for a time on the back of the mother, hanging on curiously by twisting their tails around that of the parent. To all Australians, however, the Phalangers are the familiar "Opossums," and it would be quite hopeless to attempt to bring any other name into general use.

Key to the Genera.

A.—WITHOUT FLYING MEMBRANE.

1.	Ears more or less hairy on the outside.	
	Ears nearly or quite naked.	5
2.	Tip of tail naked all round.	3
	Tip of tail naked below.	4
3.	Ears hairy inside and outside.	Phalanger.
	Ears hairy on the outside only.	Trichosurus.
4.	Body without broad black and white stripes.	Pseudochirus.
	Body with broad black and white stripes.	Dactylopsila.
5.	Tail covered with hairs throughout, bushy at the tip.	Gymnobelideus.
	Tail with fine scales and short hairs (muriform).	Dromicia.

B.—With Flying Membrane.

1. Tail longer than the head and body, evenly bushy.	2
Tail as long as the head and body, feathered.	Acrobates.
2. Tip of tail naked beneath, prehensile.	Petauroides.
Tip of tail not naked, not prehensile.	Petaurus.

Genus Phalanger.

Size in our species large; form stout. Ears small, thickly clothed inside and out with soft woolly hair. Fur thick and woolly. Flanks without flying-membrane. Fingers subequal. Claws long, stout and curved. Tail strong, tip naked all round, prehensile. Arboreal.

The Spotted Cuscus.

Phalanger maculatus.

Eyes small, red. Colour of upper surfaces variable with combinations of white, rufous and black, often conspicuously spotted; below yellowish white. Tail deep yellow, the hinder part free from hair. Head and body about twenty-six inches; tail nineteen inches. Cape York District, Southern New Guinea, the Moluccas, and Waigiou.

The Cuscus has not a pleasant temper, and is not docile in captivity, being dull, spiteful, and quarrelsome. Two placed together are apt to fight with fury, "growling like cats, and biting each other viciously." It is nocturnal in its habits, feeding on fruits and young shoots, but not confining itself entirely to a vegetable diet.

Opossums.

Genus Trichosurus.

Size large, form stout. Ears medium or short, more or less hairy behind. Fur thick and woolly. Flanks without flying-membrane. Fingers not opposable. Claws large and strong. A gland on the chest. Tail strong, not tapering, evenly bushy, naked underneath for the hinder half or third, the tip naked all round. Arboreal, feeding on gum leaves and young shoots, nocturnal in their habits. Australia and Tasmania.

The Short-eared Opossum.

Trichosurus caninus.

The larger Opossum. Ears short, broader than long, rounded. Fur comparatively short. Grizzled-grey or amber-brown above, paler on the sides and below. Tail very thick and bushy, nearly wholly black. Head and body about twenty-two inches; tail fifteen inches. Southern Queensland, New South Wales, and the higher country in Victoria, the islands of Bass Strait and Tasmania.

Closely allied to the succeeding species, especially to the Tasmanian Opossum, but at once distinguished by the ears.

The Victorian naturalists in their three expeditions, to the Kent Group, to the Furneaux Group, and to King Island, met with the Short-eared Opossum in all. In Kent Island these animals do not seem to feed on the leaves of the Eucalyptus trees, as they are generally to be found where these trees are not growing, and their scratches were seldom to be detected on the trees themselves. Their food appears to consist entirely of succulent plants, and they seldom seem to leave the ground. During the day they retire, either under stones, if near the sea-shore, or under the thick tussocks of grass which grow so abundantly in the island. One obtained in the bush was sleeping under the old up-turned root of a she-oak, and when disturbed never attempted to climb any of the trees, but kept to the ground.

The Common Opossum.

Trichosurus vulpecula.

The smaller, and most widely distributed Opossum. Ears long and narrow, much longer than broad, and tapering towards the tips. Fur close, thick and woolly. Upper surfaces grizzled-grey; the chin blackish, a rusty patch on the chest, the rest of the under surfaces whitish or yellowish. Tail, thick, bushy; the hinder part black, naked underneath. Head and body about eighteen inches; tail eleven inches. All Australia except the Cape York District. In the Centre, Spencer says it is very widely distributed, occurring everywhere amongst the eucalypts which border the river beds.

The Tasmanian Opossum is larger and stouter in build, larger even than the Short-eared Opossum, and the fur is longer, darker and thicker. The tail is very thick and bushy, and almost wholly black. The skins are greatly prized for rugs.

The Opossums are destroyed in thousands for the sake of the fur, as well as for sport. They are either shot or trapped. For shooting a moonlight night is chosen. The trees which the animals frequent are betrayed by the track scored on the trunks by the sharp claws of the Opossums as they climb; and are marked down in the day time. The sportsman works round the tree so as to bring the Opossum between his eye and the moon, not quite so easy an operation as may seem, for the branches and pipes and foliage are friendly to the animal, and do their best to hide him from the view. As Mozeley well described it, "The sportsman places himself so as to get successive portions of the tree between his eye and the moonlight, and thus searching the tree over, at last he catches sight of a dark mass crouching on a branch, and usually sees the ears pricked up as the animal watches the danger. This is called 'mooning' the Opossums. Then with a gun in one's hand one fully realises for the first time the meaning of the saying ''possum up a gum-tree.'" A first shot is not always successful, even if a hit, for the Opossum if wounded only will cling by claws and tail to the branches, and more shooting is required. Even if killed finally, the hold taken while in the death-struggle may suffice to fasten the body in an inaccessible position.

Macl. Mus.

Common Opossum.

G

To trap the Opossum a short forked branch is laid against the tree in line with the track on the trunk, which is sometimes continued on the ground. so as to form a convenient bridge for the animal to use as it descends to earth. About a foot from the fork a noose is fixed on the bridge. The Opossum comes down head first, and puts its head in the noose, and is caught. The artistic method of procedure is to arrange the noose and the branches so that the animal falls off and is hung, space being granted so that it cannot catch hold of the trunk. The inartistic method is to leave the poor creature in the noose until the morning when the traps are examined, and then hammer it to death by blows on the head.

Austr. Mus.

Black Tasmanian Opossum.

In the daytime the Opossums take shelter in holes in the dead branches of the trees, sometimes making a rough nest at the bottom. Climbing is therefore necessary to obtain them. The blacks were great adepts at climbing, even high and smooth-barked trees, cutting steps with a tomahawk, and working themselves up by the aid of a creeper used as a rope.

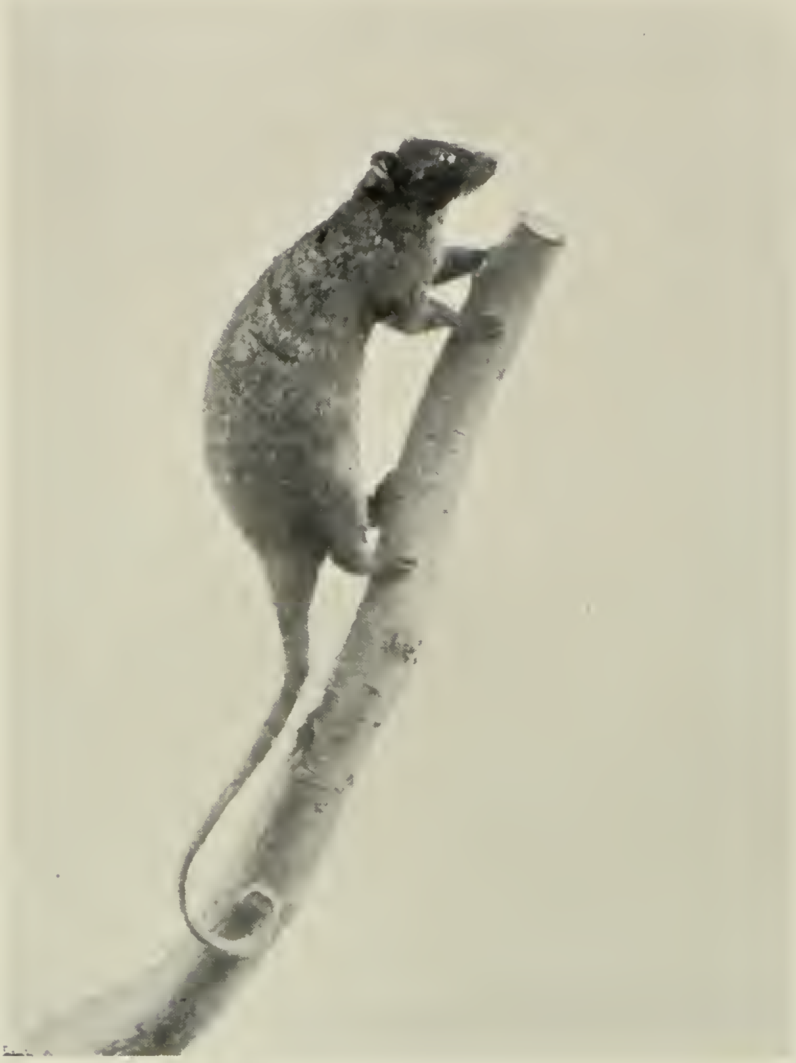
The female usually brings forth one young one, in marked contrast to the true Opossum, which will sometimes be seen carrying a dozen or so on her back. This slow rate of reproduction is evidently an important factor in the question of the preservation of this valuable fur-bearing animal.

Opossums are easily domesticated, and are often kept as pets; though sleeping in the day, they come out in the evening, and will take their food from your hand, and amuse you by their easy graceful movements. They do not usually show much sagacity, but one instance recorded in the *Victorian Naturalist* (from the *Camperdown Chronicle*) would seem to show that the homing faculty is occasionally present. Mr. Joseph Mack, M.P., relates that his sisters were one night disturbed by the sound of soft scratching on the window, as if some animal were trying to enter. Upon opening the window they saw an Opossum. They fed the animal with sugar, and continued to do so night after night until it became quite domesticated. Some time after, they gave it to a clergyman who was visiting the station, and who carried the Opossum with him to Bellarine, about 65 miles distant. About nine nights after, the Misses Mack were again disturbed by the sound of something scratching at the window, and, on lifting up the sash, to their great surprise, they saw their pet Opossum. The clergyman, when communicated with, stated that he had taken the animal to Bellarine, and that it had escaped the same night. So the Opossum must have remembered its friends and their sugar, have travelled back by marvellous instinct over the 65 miles, and having obtained admission before by scratching the window pane, adopted the same tactics on its return.

Genus Pseudochirus.

The Ring-tailed Opossums.

Smaller than Opossums. Ears not large, hairy behind except at the tips. Fur short and rather woolly. Flanks without flying-membrane. Fingers subequal, the inner two markedly opposable to the rest. Claws moderate. No gland on the chest. Tail long and tapering, hairs shorter behind; tip naked below for greater or less distance; very markedly prehensile. Arboreal. New Guinea, Australia, Tasmania.



Austr. Mus.

Ring-tailed Opossum.

Archer's Ring-tailed Opossum.

Pseudochirus archeri.

Ears very short, broader than long. Fur short, close and thick. Greenish-yellow above; a pale yellow band over the eye, and a white one beneath the eye, a white spot behind the ear; a blackish medium band down the back, with a less pronounced white black-edged border on each side. Chin greyish, the rest of the under-surfaces white. Distal third of the tail white; under surface of the tail naked for nearly the latter half. Head and body about fourteen inches; tail thirteen inches. Herbert River District, North Queensland.

Lumholtz, who discovered this animal, says that, from its peculiar greenish-yellow colour with the indistinct stripes of black and white, it looks very much like a moss-grown tree-trunk. Though a night animal, it also comes out about three or four o'clock in the afternoon, and runs about in the branches of the trees.

The Tasmanian Ring-tailed Opossum.

Pseudochirus cooki.

Ears rather large, rounded. Fur very thick, close and woolly. Dark smoky-brown above, white below. Hands and feet very dark, even black. Tail dark brown, the distal two to four inches white; naked beneath for the last (distal) three to five inches. Head and body about fourteen inches; tail about the same length. Tasmania.

The Western Ring-tailed Opossum.

Pseudochirus occidentalis.

Deep smoky-grey above; white below. Hands and feet darker. Tip of tail white for five or six inches, naked underneath for about four inches. Head and body about thirteen inches; tail twelve inches. West Australia.

The Common Ring-tailed Opossum.

Pseudochirus peregrinus.

Ears rather large, rounded. Fur soft, thick, woolly. Grey or rufous above in varying proportions, region about the eyes often markedly rufous, below white, greyish, or rufous. Tail with the middle third black, tip for one to four inches white, naked for about the same distance. Head and body about sixteen inches; tail fourteen inches. Southern Queensland, New South Wales, Victoria, to South Australia.

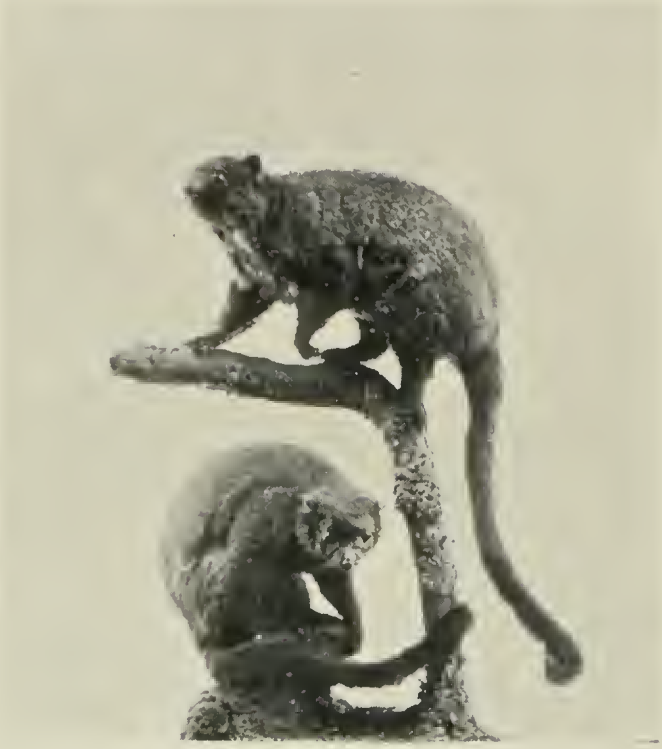
It will be seen that the differences between this and the two preceding species are not great. The present is the most widely distributed of the Ring-tails, and it seems most probable that the Tasmanian and the Western forms have been derived from it, having been isolated by the physical changes which produced Bass Strait, and converted the region north of the Great Australian Bight into an arid waste.

The Herbert River Ring-tailed Opossum.

Pseudochirus herbertensis.

Ears short, rounded. Fur thick, close, woolly. Dusky umber-brown above, the limbs often with white rings; chin brown, the rest of the under surface white or nearly so. Tip of the tail white for one to three inches, naked underneath for five or six inches. Head and body about fourteen inches; tail thirteen inches. Herbert River District, North Queensland.

A beautiful animal, presenting a striking contrast between the rich, deep brown, almost black, general colour, and the white under surfaces, tip of tail, and an occasional ring about the limbs. The habitat is exclusively the highest tops of the scrubs in the Coast Mountains.



Austr. Mus.

Sombre Opossum.

The Sombre Ring-tailed Opossum.

Pseudochirus lemuroides.

Ears moderate, rounded. Dark greyish brown above; lighter below. Hands and feet darker. Tail dark brown, nearly black; no white tip; the naked part extremely short. Head and body about fifteen inches; tail twelve inches. Herbert River District, North Queensland.

This, the third species discovered by Lumholtz, approaches more nearly than any of the others to the Opossums proper (*Trichosurus*).

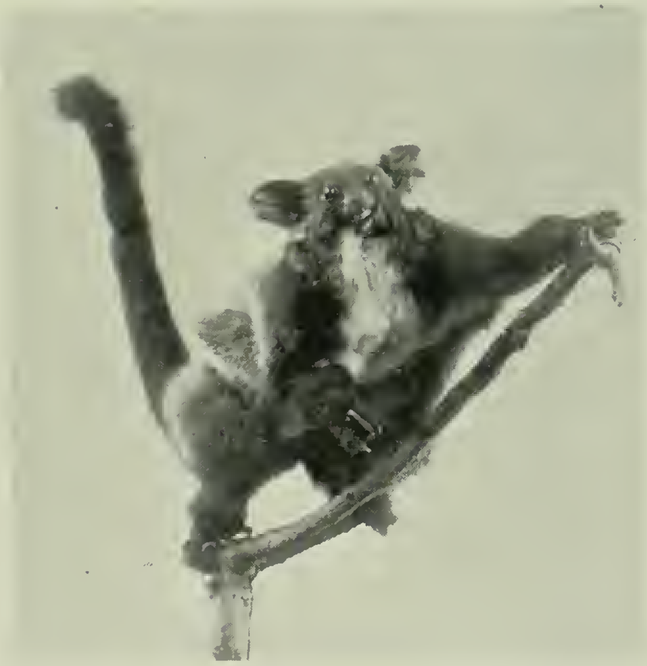
Genus Petauroides.

Fur very long, soft and silky. Ears very large, oval. Flanks with a flying-membrane. Claws very long, sharp and strongly curved. Tail very long, cylindrical, evenly bushy; the extreme tip naked underneath and prehensile. Arboreal.

The Greater Flying-Opossum.

Petauroides volans.

Dark grey to black above; white or yellowish below. Head and body about seventeen inches; tail twenty inches. Eastern Australia from Queensland to Victoria.



Austr. Mus.

Greater Flying Opossum.

The largest of our "Squirrels." A very handsome animal with its long soft fur and highly contrasted black upper and white lower surfaces.

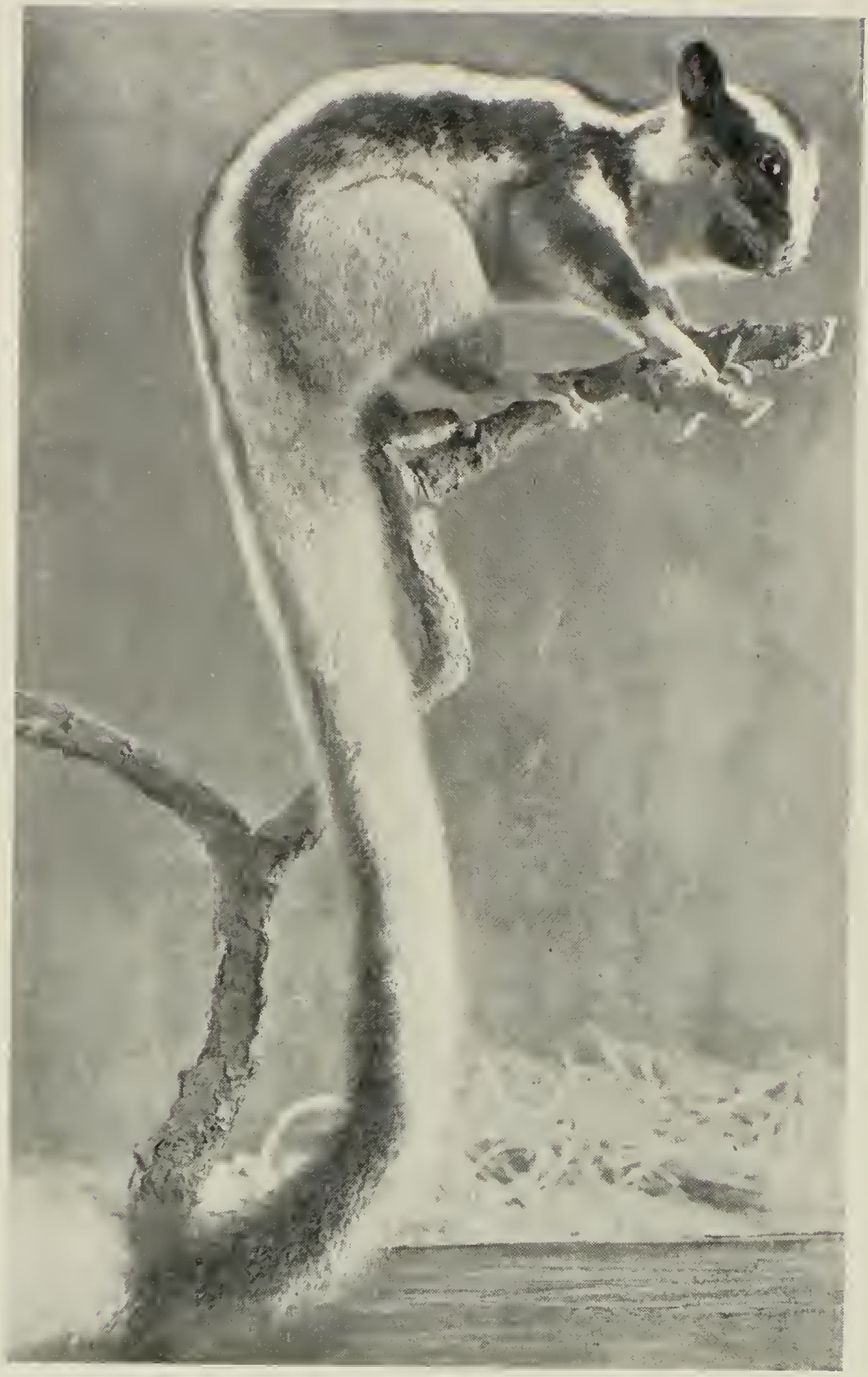
A smaller variety, with the middle teeth of the upper jaw less developed is met with in Central Queensland.

Genus Dactylopsila.

Fur close, thick and woolly, but rather harsh. No trace of a flying-membrane. Fingers very unequal, the fourth much the longest. Claws long. Tail long, cylindrical, evenly bushy, the extreme tip naked below. Arboreal; phytophagous.

The Striped Opossum.

Dactylopsila trivirgata.



Striped Opossum.

White above with three brown-black stripes; white or yellowish below, except for a black spot on the chin. Tip of the tail sometimes white. Head and body about twelve inches; tail thirteen inches. Central Queensland to Waigiou Island.

Genus Petaurus.

Fur very soft and silky. Flanks with a flying membrane. Fingers lengthening evenly outwards, the fifth the longest in the larger species. Claws strong, sharp, much curved. Tail long, evenly bushy. Arboreal; phytophagous.

The Yellow-bellied Flying-Opossum.

Petaurus australis.

The largest and darkest species. The upper surfaces brown, darkest along the mid-line of the back and over the flying-membranes; here and there becoming orange or black; a prominent yellow patch along the hind margin of the ear; free edge of the membrane orange; the back of hands and feet black. Below, the chin is blackish, but the rest of the under surface deep orange. The tail, very long and bushy, is grey above and orange below, darkening to black at the tip. Ears long and narrow. The fifth finger the longest. Head and body twelve inches, tail thirteen. Coast ranges of New South Wales and Victoria.

The Squirrel-like Flying-Opossum.

Petaurus sciureus.

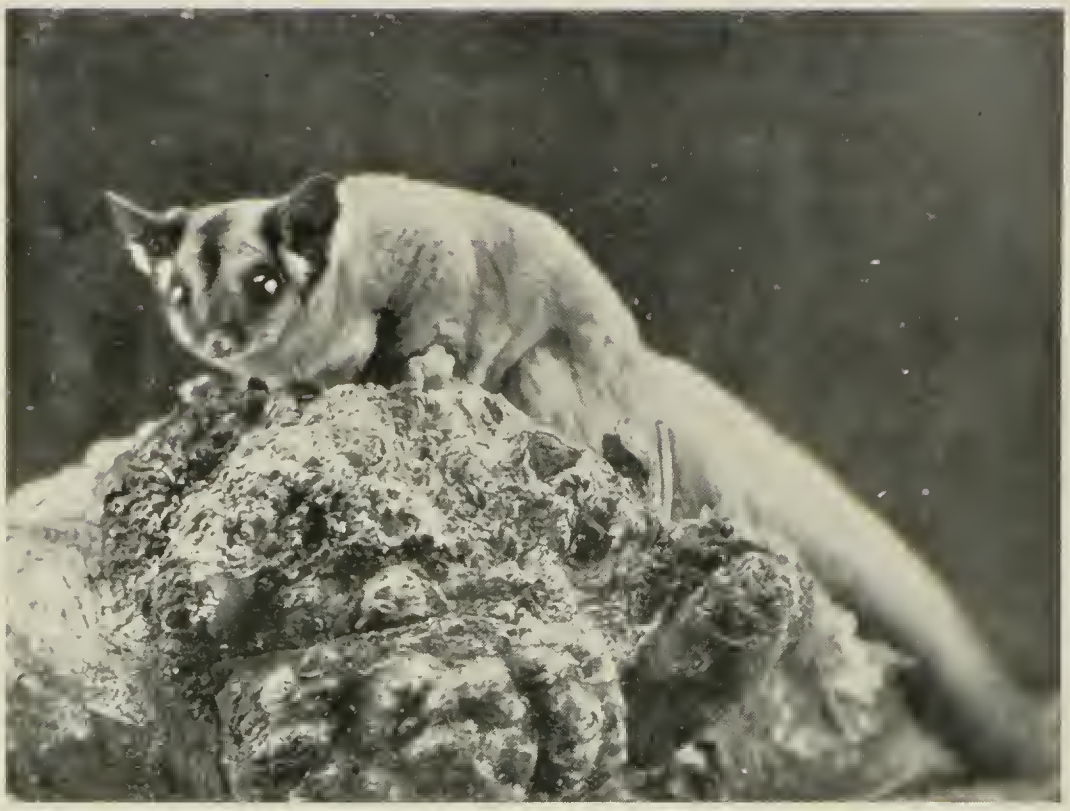
The intermediate species. The brown of the upper surfaces of *P. australis* is replaced by pale grey, the orange of the under surfaces by white or yellowish-white; a dark brown or blackish band persists, however, along the mid-line of the back, and the upper surfaces of the membranes are darker, the free edges white or pale yellow; the back of the hands and feet white or pale grey. The tail, not much longer than the head and body, is very bushy, for the most part grey, but darkening to black behind. As in *P. australis* the fifth finger is the longest. Head and body ten inches, tail eleven inches. Eastern Australia from Queensland to Victoria.

The Lesser Flying-Opossum.

Petaurus breviceps.

The smallest of the three species. The colouring is much the same as in *P. sciureus*, but the dorsal band is generally indistinct. In contrast to the other species, the fourth finger is the longest. Head and body seven inches, tail eight inches. Northern and Eastern Australia. Introduced, according to Ogilby, into Tasmania in 1835.

Perhaps the most charming of our mammals as a pet, from its bright little eyes, its soft delicate coat, its graceful movements, and the pretty confidence which it shows while in captivity. A friend brought me one to Sydney from North Queensland. For some months he lived at large in my study. During the day he rested and slept on the top of the Venetian blinds of one of the windows, but as evening came on he would wake and fly down for his milk and biscuit or sugar. "Beauty," as the children called him, would take his exercise by making flights from chair-back to chair-back, or from one of the children to another, alighting gently and without noise on head or shoulder. He never screamed, and never appeared to be in any way disconcerted if strangers, even a number of them, came into the room.



From life. *Melb. Zoo.*

Lesser Flying Opossum.

Genus Gymnobelideus.

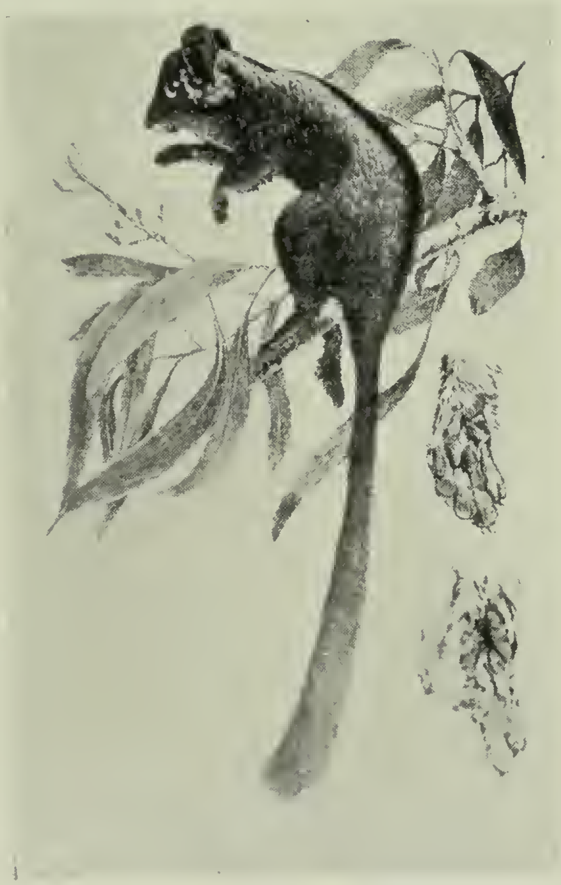
Intermediate in size between *Petaurus* and *Dromicia*; in appearance like *Petaurus*, but without flying-membrane. Ears large, naked. Pads of the toes with prominent wrinkles. Claws small. Tail long, cylindrical, bushy at the tip. Bass River, Victoria. Arboreal; phytophagous.

Leadbeater's Opossum.

Gymnobelideus leadbeateri.

Fur soft and dense. Brownish-grey above, with a medial dusky streak on the nape and back; the under-surfaces dull yellowish. Tail pale brown, lighter than the body. Head and body about five and a half inches, tail six and a half inches.

Of this, the rarest of the Opossums, only three or four specimens have been captured, all from the scrub on the banks of the Bass River, in Victoria.



McCoy Prod. Z.V.

Leadbeater's Opossum.

Genus Dromicia.

Fur thick and soft, rather woolly. Ears large and thin, almost naked. No flying-membrane. Fingers and toes without broad terminal pads; fore-claws short and obsolete; hind-claws developed. Tail cylindrical, its base furry, the rest finely scaled, with short hairs, the extreme tip beneath roughened, naked and prehensile. Arboreal; phytophagous.

These little animals have the habit of curling themselves up in Dormouse fashion. The three species do not differ very greatly in size or habit. The Common Dormouse-Opossum, *D. nana*, is the largest, measuring about four inches in head and body; the Western, *D. concinna*, measures about three, and the Lesser, *D. lepida*, rather under three inches: in all the tail is a little longer than the head and body. *D. concinna*, found in South and West Australia, is bright fawn coloured above, and pure white below. *D. nana*, occurring in southern Victoria and Tasmania, above dull fawn, below slate-coloured, tipped with whitish. *D. lepida*, confined to Tasmania, pale bright fawn above, below as *D. nana*.

From life. *Melb. Zoo.*

Thick-tailed Dormouse-Opossum (Hibernating.)

Genus Acrobates.

Fur soft, straight and silky. Ears moderate. A narrow flying-membrane. Fingers and toes with broad terminal pads; claws developed. Tail with a broad fringe of hairs on each side. Arboreal; insectivorous.

The Pigmy Flying-Opossum.

Acrobates pygmaeus.

A light and delicate little creature. Greyish-brown above, white below and on the inner sides of the limbs; tufts of hair just behind the eye, and inside the ears, fawn coloured in front and white behind; the edges of the membrane fringed with longer hairs, as is also the tail. Tail with the extreme tip below naked, probably prehensile. Head and body three inches; tail of the same length. Southern Queensland, New South Wales, and Victoria.

Macl. Mus.

Pigmy Flying-Opossum.

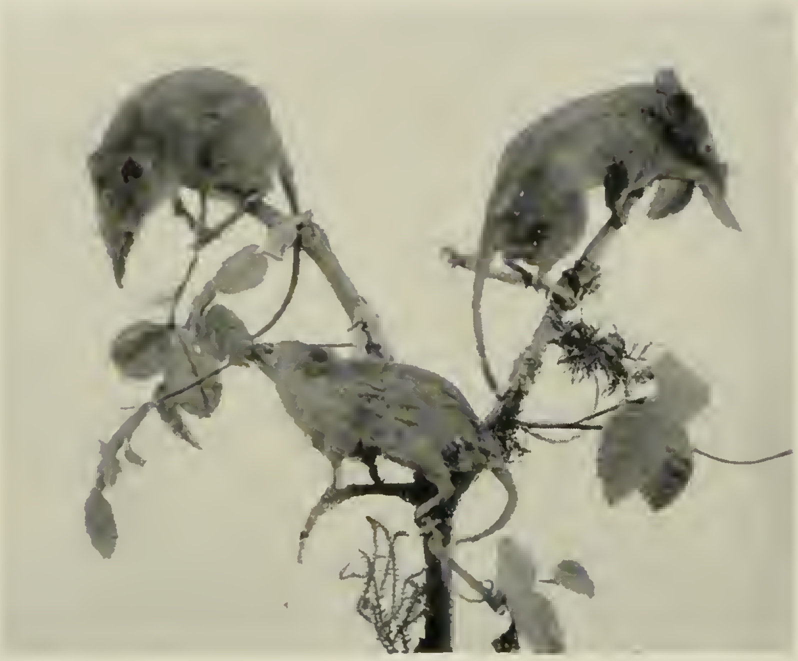
Sub-family Tarsipedinae.

This sub-family is created to include the very remarkable *Tarsipes rostratus,* a little arboreal mouse-like creature, adapted like the Honey-eaters for the extraction of the nectar from flowers, and like the Ant-eaters for the rapid capture of insects. The head is long and narrow, the snout much drawn out, and the tongue long. The ears are small, and the teeth are reduced in number. The little bones are especially light and slender. The toes, something like those of the Lemur, with most of the claws rudimentary; the palms and soles naked and padded. The tail is very long and slender, thin-haired and prehensile. A distinct pouch is present.

The Long-snouted Pouched Mouse.

Tarsipes rostratus.

Fur short and hispid. Grey above striped with black or brown; yellowish-white below. Tail brown above, white or yellowish below, naked below at the extreme tip. Head and body three inches, tail four inches. West Australia.



Tarsipes rostratus. *Austr. Mus.*

A rare animal, crepuscular or nocturnal in its habits. In captivity an adept at catching flies. Obtains the honey from the flowers with its tongue, in the manner of a hawk moth.

Family Phascolomyidae.

Form stout and clumsy. Muzzle short and broad. Clavicles strong. Limbs subequal, very thick and strong. Fore feet with five subequal digits, each with a stout claw; hind feet with the hallux short and clawless; the other toes with long, curved claws, the second and third with a slight tendency only to syndactylism. Tail rudimentary. Pouch present.

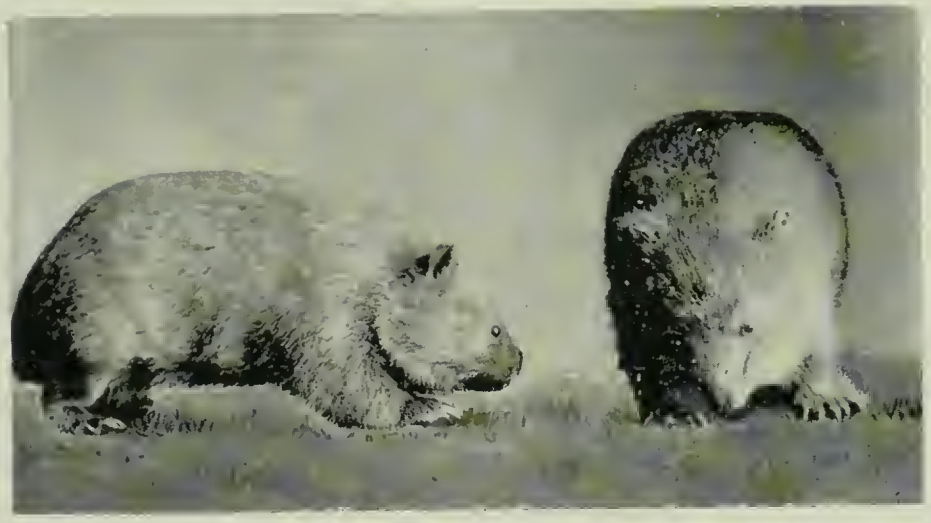
Genus Phascolomys.

Characters those of the Family.

The Common Australian Wombat.

Phascolomys mitchelli.

Rhinarium (tip of the nose) large, naked, and black. Fur coarse and harsh. General colour variable black, grizzled yellow and black, or yellowish. Ears short and rounded. Ribs fifteen. Head and body about forty-four inches. New South Wales, Victoria, and South Australia.



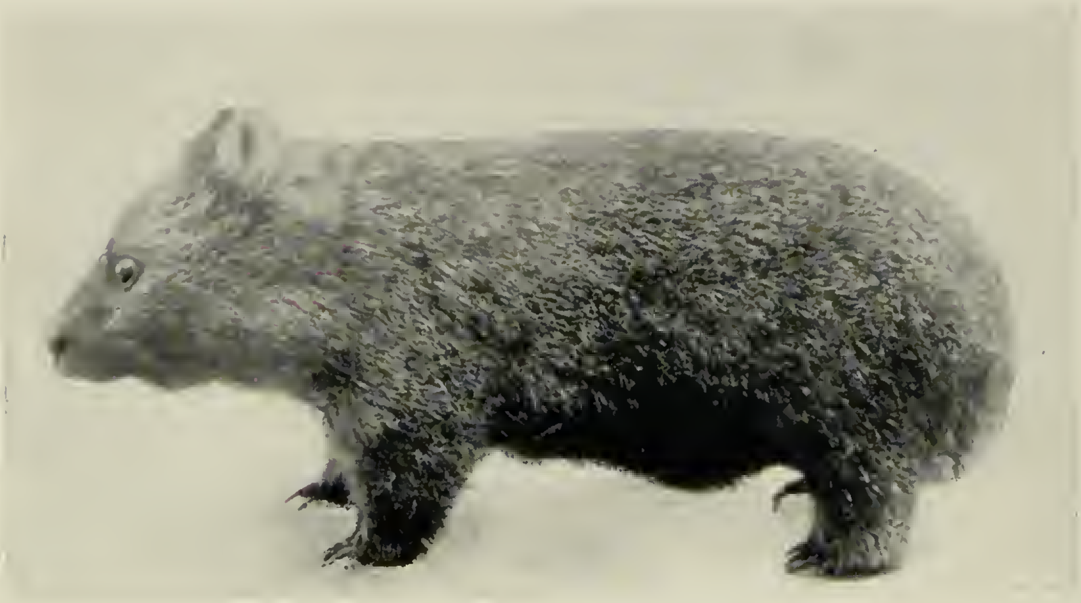
Wombats. *Macl. Mus.*

The Tasmanian Wombat.

Phascolomys ursinus.

Smaller than the preceding, head and body about thirty-eight inches. General colour, above and below, dark grizzled, greyish brown. Tasmania and the islands of Bass Strait.

At a glance the Wombats are seen to be markedly different from all the other Marsupials. They are monuments of compact brute strength, as is necessary for the underground engineer whose implements are part of his person. Hence the sturdy form, the stout skeleton, the powerful muscles, the short limbs, and the strong digging claws of the hind feet. They work with great skill and rapidity, and make extensive burrows in the hard ground of the rock country. In the daytime the Wombat rests in his burrow, or if tempted out by hunger shuffles along the ground like a Bear. Mr. Hardy saw one in the Victorian highlands standing with its legs deep in snow, and with the ends of the grass-like *Xerotes* projecting from its mouth. On being disturbed it butted down the steep hillside, a shower of snow following the rush. It is fond of new hay, and chooses the sweet and succulent parts of the native herbage. There is a pair of stout incisors in both upper and lower jaws, as in the Rodents, with which it cuts its food, and with which, too, it is capable of giving a shrewd bite, which may be awkward for the dog which has been sent in to eject the "Badger" from its burrow.



Tasmanian Wombat. *Macleay Mus.*

The Hairy-nosed Wombat.

Phascolomys latifrons.

Rhinarium hairy, velvety and white. Fur straight, soft and silky. General colour mottled grey above, cheeks, throat, and chest white, otherwise greyish below. Ears longer and narrower than in the preceding, and pointed. Ribs thirteen. Head and body about forty inches. South Australia.

SUB-ORDER POLYPROTODONTIA.

Incisors numerous, four or five in the upper, and three or four in the lower jaw, on each side, subequal, much smaller than the canines. Molars generally sharply cuspidate. Carnivorous or insectivorous, rarely omnivorous.

Key to the Families.

1.	Adapted to an underground life. No eyes or external ears.	Notoryctidæ.
	Adapted to a terrestrial or arboreal life. Eyes and ears well developed.	2
2.	Limbs subequal. Hind toes all free.	Dasyuridæ.
	Hind limbs longer. Middle toes of hind limbs united.	Peramelidæ.

From life. Wombat Sleeping. *Melb. Zoo.*

Family Notoryctidae.

Limbs nearly equal, short and very strong. Fingers and toes five, all clawed. No eyelids, eyes quite degenerate. Ears without conch. Clavicle well developed. Central Australia.

Genus Notoryctes.

Characters those of the Family.

The Marsupial Mole.

Notoryctes typhlops.

Form stout. Head and body 5 to 6 inches, tail about one inch long. Snout covered by hard horny shield; ear-openings present but concealed by the fur: no distinct neck. Body flattened. Tail hard and tough, marked by distinct rings, thick at the base and rapidly tapering to a blunt tip. The axis and four following cervical vertebræ are firmly united together, as are all the sacral vertebræ. Marsupial bones (to support the pouch) are well developed. The claws of the third and fourth digits are enormous.

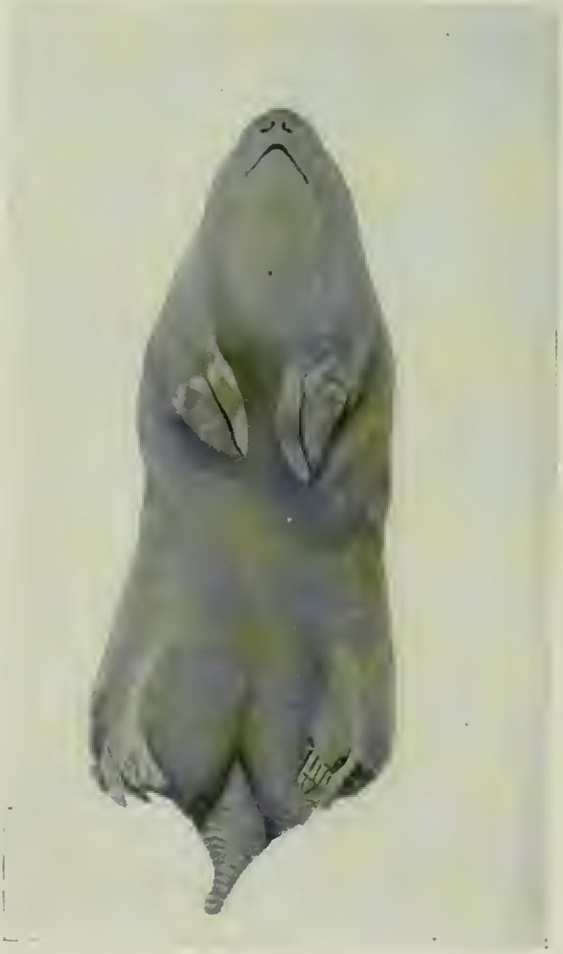
Teeth, the number in front of the molars is variable. In the upper jaw the full number is 4 incisors, 1 canine, 2 præ-molars, and 4 molars. The lower jaw differs in carrying 3 incisors and an extra præ-molar.

The fur is long, soft and silky, and consists of an under fur of very fine hairs, and of much fewer longer and somewhat flattened hairs. The colour varies from a light almost silvery tint to a rich chestnut brown, with an iridescent effect in the live animal.

The pouch varies in size according to the season. It opens backward, and may have an internal width of half an inch, with a depth of one-third of an inch. There are two white mammæ, which are well marked in the breeding season. Spencer noted, and commented on, the indication of a rudiment of a pouch in some of the males which he obtained. Our knowledge of the Mole has been almost entirely obtained from Dr. Stirling and Professor Spencer.

The Mole is very rare, and difficult to observe or capture owing to its habits. It seems to be confined to the Centre and to adjacent parts of West Australia. It is found among the sand-hills. It does not form a permanent burrow or run such as the European Mole constructs. When in search of food it forces its way through the surface sand, and at the breeding season burrows deeper down into the solid ground, the female probably remaining in the burrow at that time. It is profoundly modified for the life which it leads, the snout protected by a shield, the tail leathery, the front and back segments of the backbone strengthened by union, the limbs short and stout, the digging claws long, broad, and strong, the muscles which directly work them powerful, while the intrinsic muscles of the hand are more reduced than in any other mammal. There are no external ears, and the eyes are atrophied.

Dr. Stirling writes of a live Mole in his possession: "The animal was let loose in the sand in the garden. It travelled over the surface pretty quickly, and with a lateral undulating movement of the body, which was at the same time appressed to the ground. It tried repeatedly to burrow, but was soon stopped by the hard earth which lay beneath the two or three inches of loose surface sand. Eventually it began to make its way into the hard substratum. In burrowing it seems to use its snout to assist in boring its way, and the claws of the fore-paws were used as much for cutting as for scooping; the edge of the large triangular nail of the fifth digit being an efficient instrument for this purpose. The fore-paws work under the body and do not throw the sand outwards. The hind-paws come into play as soon as it gets its body well under the surface, and are used to push back the sand.



Proc. R. S. South Australia.

Marsupial Mole.

The track when moving on the surface is peculiar and unmistakable, the tail, being closely appressed to the ground and seeming to form a sort of fulcrum or *point d'appui*, leaves a zig-zag continuous trail, and on each side of that is a more or less interrupted and confused track made by the paws, which are never lifted but dragged along. The belly also remains in contact with the surface.

When taken in the hollow of the hand it made no attempt to bite, but worked away with its snout and paws in its unavailing attempts to burrow through the fingers.''

Mr. Byrne, in a letter to Professor Spencer, says: ''A few days ago I had a Notoryctes alive for about twenty-four hours, but he was very weak when brought in, and seemed unable to burrow to any depth in the tub of sand into which I put him. He ate one ''witchetty'' (grub), and once or twice, when everything was quiet, he elevated his head and tail quietly, and made a slight chirping noise, which he repeated two or three times, running forward a few steps between each cry. I fancy that fear has a good deal to do with their dying so quickly in captivity, as they are very nervous little animals, and the slightest sound disturbs them and starts them burrowing. When held in the hand they scratch incessantly.''

Miss G. Sweet has investigated the structure of the eye. The organ has quite degenerated. There are no eyelids, no eyeballs or muscles for moving one, no lens or retina. There cannot be the least power of vision. The only parts connected with the eye which have survived are the lachrymal gland and ducts and the corneal sac. The gland has indeed been enormously developed, and the secretion doubtless serves the very important purpose of preventing particles of sand from entering or accumulating in the nasal cavity, while the animal is burrowing in the fine surface sand. That the eye was once functional is apparent from the presence of the modified organs now represented by neutral tissues, and it seems plain that the animal has in long ages become altogether specialised in order to adapt it to its very peculiar habits and its arid environment.

It feeds on ants and their eggs, of which there is an infinite supply in the Centre, but no doubt picks up any other insects or larvæ which come in its way. ''As *Myrmecobius* with its long tongue is fitted to feed upon ants on the surface, so *Notoryctes* is able by its burrowing habits to attack them in their nests underground." (Spencer). Neither, however, is likely to make any impression on the countless myriads of the ants of our desert region.

From its structure *Notoryctes* is seen to be a true Marsupial, although some features, as for instance some of the arrangements of the muscles—(Professor J. T. Wilson)—show a relationship, perhaps remotely ancestral, to the *Edentata*. Spencer concludes that it is in no manner whatever an intermediate form between Monotremes and Marsupials.

Family Dasyuridae.

Limbs subequal. Fore feet with five digits; hind feet with four or five free toes, the hallux small and clawless, or absent.

Sub-family Myrmecobiinae.

Muzzle long and pointed. Tongue long, slender and extensile. Lower lip rounded, projecting beyond the teeth. Teeth more numerous than in any other of the Marsupials, normally 52 in number, the molars small, more than four in each ramus, those of the lower jaw with the inner cusps larger than the outer. Chest with a complex gland, opening to the surface by several large orifices.

Genus Myrmecobius.

The characters of the Sub-family.

The Banded Ant-eater.

Myrmecobius fasciatus.

Graceful and squirrel-like, of the size of the Rat. Fur rather coarse, short and hispid on the fore part, longer behind both above and below. Ears long, narrow and pointed. Fore limbs stout, toes with long curved digging claws; hind limbs serving more for the support of the body, toes four with long claws. Tail long and bushy. Colour above bright reddish, darkening behind, where it is crossed by eight or nine white or light bands; clear pale yellow below. Head and body ten inches, tail seven inches. South and West Australia, apparently not reaching to the Centre.

Gilbert says: "It appears very much like a Squirrel when running on the ground, which it does in successive leaps, with its tail a little elevated, every now and then raising its body and resting on its hind-feet. When alarmed, it generally takes to a dead tree lying on the ground, and before entering the hollow, invariably raises itself on its hind-feet to ascertain the reality of approaching danger. In this kind of retreat it is easily captured; and when caught, is so harmless and tame as scarcely to make any resistance, and never attempts to bite. When it has no chance of escaping from its place of refuge, it utters a sort of half-smothered grunt. The female is said to bring forth her young in a hole in the ground or in a fallen tree, and to produce from five to nine in a litter." It is not nocturnal in its habits.

Banded Ant-eater. *Austr. Mus.*

The *Myrmecobius*, while it has the inflected lower jaw and the epipubic bones of the Marsupials, has actually no pouch. The young adhere to the mother's nipples, protected by the long soft fur of her body.

When small mammalian lower jaw-bones were discovered among the fossils of the Stonesfield slate in the English Jurassic beds, Owen was at once struck with the remarkable similarity which they showed to the lower jaws of Myrmecobius. So close is the resemblance that Mr. Oldfield Thomas suggests that "*Myrmecobius*, like *Ceratodus*, may be actually an unmodified survivor from Mesozoic times."

Sub-family Dasyurinae.

Tongue short and simple, not extensile. Lower lip not produced. Molars large, four in each ramus, those of the lower jaw with the outer cusps larger than the inner. No chest gland.

The sub-family includes three groups, one of small animals parallel to the Shrew-Mice, a second resembling the Weasels and Martens, and the third of larger kinds taking the place of the Jackals or smaller Wolves, of the Eutherian Mammals.

Genus Antechinomys.

Saltatorial. Body unspotted. Ears very large. Tail very long, tufted. Limbs unusually elongated; the fore-arm and still more the lower leg and hind foot especially long. Toes short and subequal, hallux absent. Palms and soles without distinct pads. No trace of a pouch.

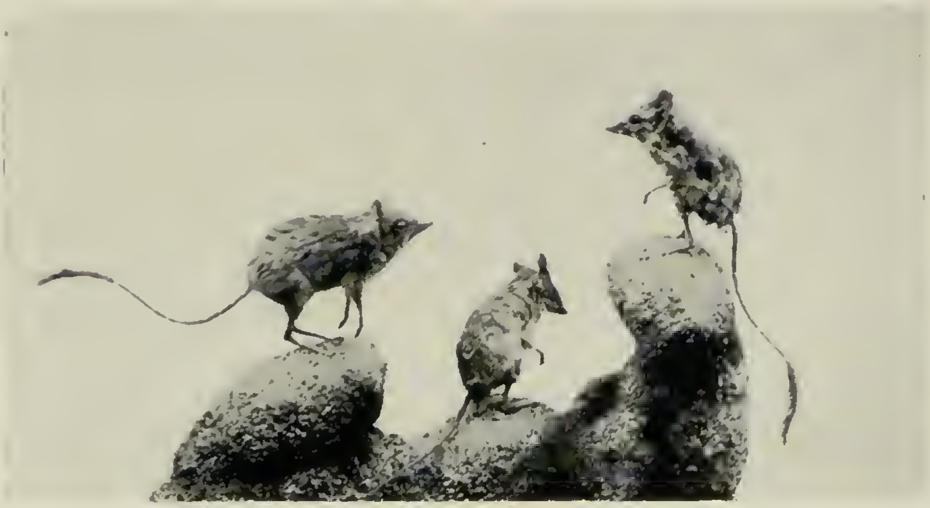
The Jerboa Pouched Mouse.

Antechinomys laniger.

Size small; form slender and graceful. Ears ovoid, almost entirely covered with short, fawn-coloured hairs, with a marked white fringe in front. Fur long, soft and fine. Above slaty-grey, below white; a fawn-coloured patch behind the ear. Tail very long and slender, short-haired, fawn-coloured except the terminal inch, which is tufted and black. Head and body three to four inches, tail five inches. Interior of New South Wales and Southern Queensland, and in Central Australia.

Spencer says: The most striking features of the animal are its slender graceful form and its disproportionately long and thin hind legs. It is purely terrestrial, living in burrows in the sandy plain districts along with countless numbers of *Hapalotis* (*Conilurus*) and a small species of *Mus*. In general appearance it bears a striking resemblance, both in colour and the form of its body, to *Hapalotis mitchelli*, but is more slender in build. It is somewhat curious to notice that two animals so differently organized as *Hapalotis* and *Antechinomys* have taken on the same habit, and live side by side, one in large numbers and the other very scarce.

Watching the animals in their natural surroundings, says Spencer, it is really difficult to see what is exactly the advantage gained by such small forms of animals in the saltatory modes of progression. The country in which they usually live is covered with big tussocks of grass and shrubs of various sizes. With a large animal, such as a Kangaroo, it is doubtless an advantage to go straight ahead instead of having to "dodge round" tussocks of grass; but these animals are far too small to spring over the grass tussocks, and the true Mouse, which live in great numbers in the same parts, and which has not taken on this saltatory method can run to shelter just as rapidly as the leapers. Possibly the real advantage of the leaping method of progression lies in the greater difficulty to the birds of prey, which are their chief enemies, of pouncing down upon the animals travelling jerkily by leaps and bounds rather than in any advantage gained in the way of speed.

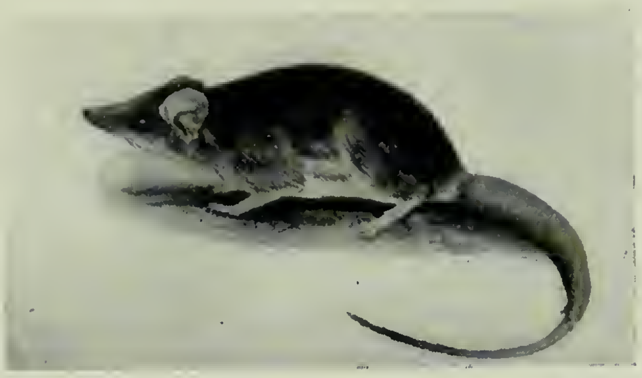


Antechinomys Laniger. *Austr. Mus.*

The number of the young seems to be six or eight.

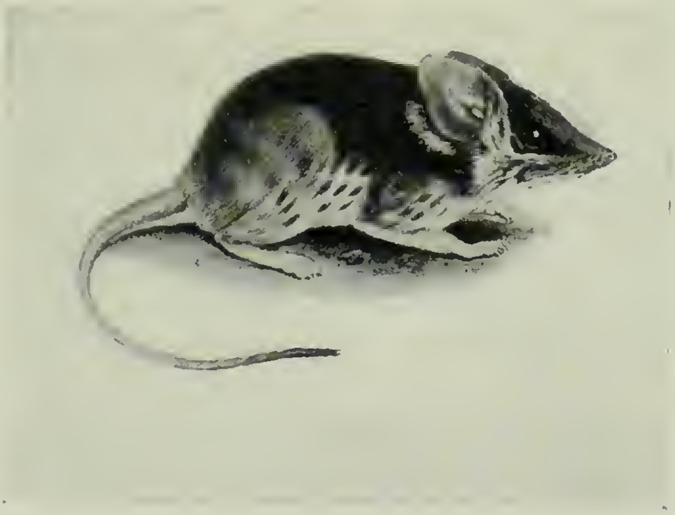
Genus Sminthopsis.

Form slender and delicate. Tongue not extensile. Ears large and broad. Tail moderate, short-haired, sometimes thickened. Feet slender and delicate, toes with small claws; hallux present, short and clawless; soles partially hairy, pads if present not distinctly striated. Pouch well developed; mammæ 8 or 10. Terrestrial, rarely burrowing. Insectivorous.



Sminthopsis Larapinta. *Horn Exp.*

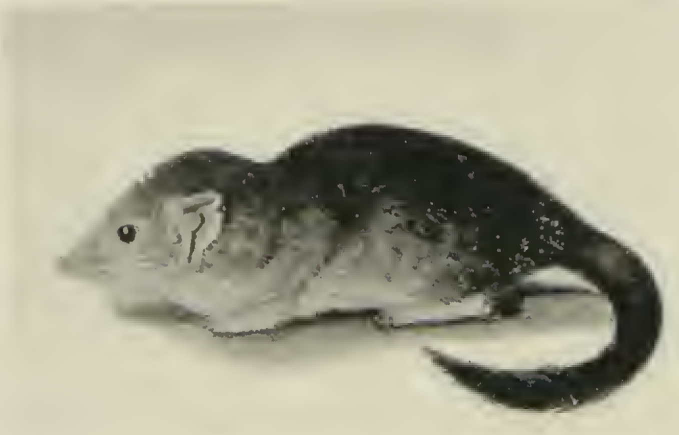
Six species have been described. They are light and active little mouse-like animals, mostly about three or four inches long, with tails of the same length or rather shorter. The tail is greatly thickened in the basal portion in *S. crassicaudata* and in *S. larapinta,* but is slender in the other species. The fur is soft



Sand-hill Pouched Mouse. *Horn Exp.*

and fine. The general colour above is some shade of grey, while the under surfaces and the feet are white. *S. psammophila* has rows of dark spots on the under half of the sides. *S. virginiae* is the largest, the head and body and the tail being about five inches long. It is also the most conspicuously coloured, the face being sandy-rufous with black longitudinal lines, one central and one on each side, and the cheeks and adjacent parts are bright rufous.

S. crassicaudata occurs all over Australia except in the extreme North, and is the most abundant species in the Centre; *S. larapinta* is confined to the stony tablelands of the Finke River; *S. murina* over the continent to the south of the Tropics; *S. psammophila* lives among the sand-hills covered with tussocks of porcupine grass in the neighbourhood of Lake Amadeus; *S. leucopus* extends over Eastern Australia from Cape York to Tasmania: *S. virginiae* is only known from the Herbert River District in Queensland.



Krefft's Pouched Mouse. *Horn Exp.*

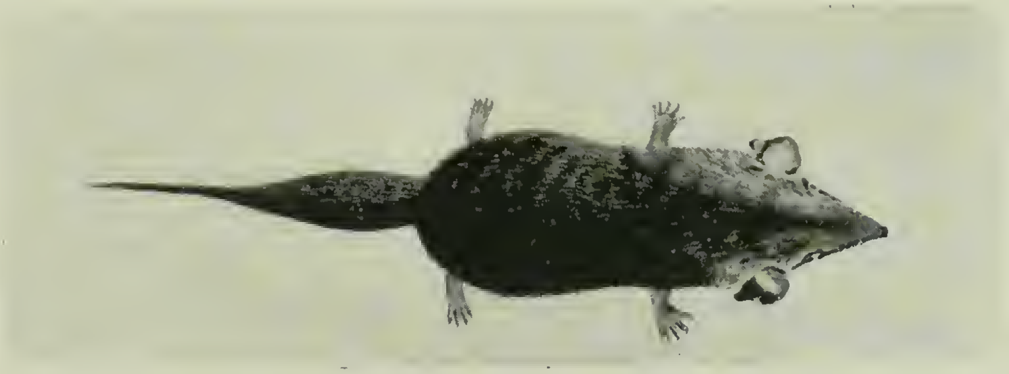
Genus Phascologale.

Form graceful. Tongue not extensile. Ears moderate, rounded. Tail long, often bushy. Feet broad and short, toes with sharp claws; hallux present, short and clawless; soles naked, with transversely striated pads. Pouch practically obsolete; mammæ 4, 6, 8 or 10. Arboreal or terrestrial, rarely burrowing. Insectivorous.

Krefft's Pouched Mouse.

Phascologale cristicaudata.

Size medium, form strong. Fur soft and close, mainly composed of the under fur. Ears short, rounded and very broad. Mouse-grey above tinged with rufous, below white or cream-coloured. Tail swollen out near the base, the proximal half chestnut-red above, dark brown below, the distal half covered with coarse black hairs which increase in length behind on both surfaces to form a distinct black crest. Head and body five or six inches, tail three and a half inches. South and Central Australia. "The animal lives in burrows, which it lines with grass, in sandy and stony table-lands."



The Fat-tailed Pouched Mouse. *Horn Exp.*

The Fat-tailed Pouched Mouse.

Phascologale macdonnellensis.

Size, medium. Fur moderately coarse. Ears rounded. Greyish-brown above, with a chestnut patch behind each ear, grey below. Tail notably stout in its proximal half, tapering rapidly at about the middle of its length, and from this gradually to the tip, covered with fairly long stiff hairs, but with no crest, lighter in colour than the body. Head and body four or five inches, tail under three inches. Alice Springs, Central Australia. Terrestrial, living in holes amongst rocks and under stones.

The Lesser Brush-tailed Pouched Mouse.

Phascologale calura.

Size medium, form slender. Fur long, soft and fine. Ears very large, almost naked. Grey and faintly rufous above, white below. Tail long; the basal half short-haired, rufons above, dark brown below; the terminal half black and slightly bushy all round. Head and body five inches, tail six inches. South, West, and Central Australia.

The Greater Brush-tailed Pouched Mouse.

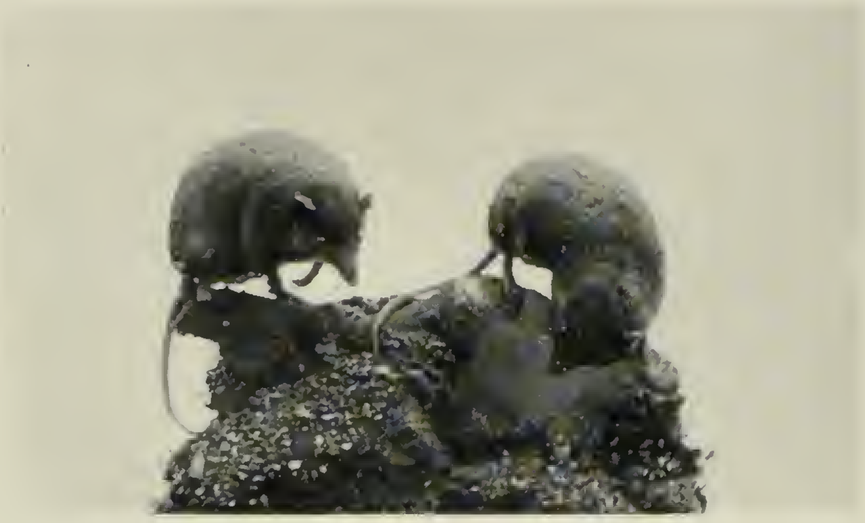
Phascologale penicillata.

The largest species; form stout and strong. Fur short and coarse. Ears very large, nearly naked. Grizzled pale grey above, below white or pale. Tail long and thick, the terminal half or more thickly clothed all round with long black hairs, forming a prominent brush. Head and body ten inches, tail nine inches. All Australia except in the extreme North. Arboreal, making a nest in the hollows of the trunks of trees, or in the branches.

The Pigmy Pouched Mouse.

Phascologale minutissima.

The smallest species. Fur short, soft, and fine, mainly composed of under fur. Ears moderate, thinly clothed with short hairs. Grizzled mouse-grey above, below paler, chin white. Tail short-haired. Pouch fairly developed. Head and body three inches, tail two and a half inches. Central and Southern Queensland and New South Wales.



Yellow-footed Pouched Mouse. *Austr. Mus.*

The Yellow-footed Pouched Mouse.

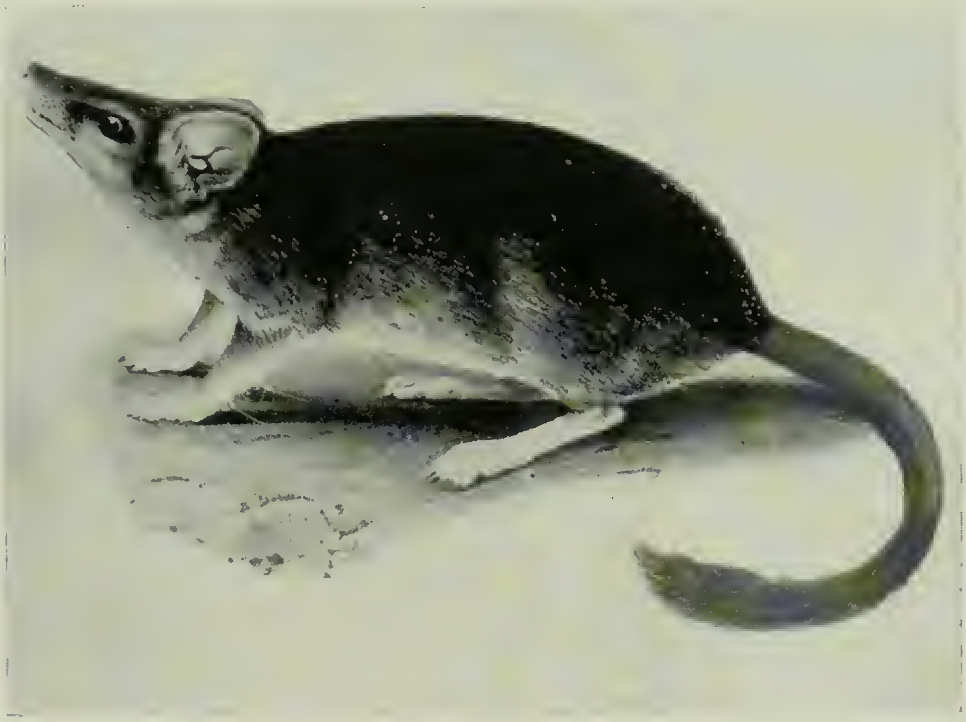
Phascologale flavipes.

Size medium, form stout. Fur close and rather crisp. Ears rather large, naked above. Grey, tinted with yellow or rufous above; below yellow or rufous. Tail short-haired, brown or yellow above, paler below, the last inch sometimes black. Limbs and feet yellow. Head and body five inches, tail three and a half inches. From New Guinea, through Eastern Australia, to South Australia. A variety or sub-species, with the underside and limbs white, is distributed over West and North Australia.

The Little Pouched Mouse.

Phascologale minima.

Size, medium, form mouse-like. Fur thick and close, rather harsh. Ears short, nearly naked. Grey above, with yellow or reddish tinge more strongly behind; below yellowish-grey, chin white. Tail closely short-haired, brown above, paler below. Head and body five and a half inches, tail three and a half inches. Tasmania and the adjoining islands.



Dasyuroides byrnei. *Horn Exp.*

Swainson's Pouched Mouse.

Phascologale swainsoni.

Size medium. Fur very long, soft. Ears short and broad, covered with short dark brown hairs. Above deep rufous-brown, below brownish-grey. Hands and feet dark brown. Tail short-haired, uniformly dark brown. Head and body five inches, tail four inches. Tasmania and South-east Victoria.

The Freckled Pouched Mouse.

Phascologale apicalis.

Size medium. Fur coarse. Ears short and rounded, hairy inside and outside. Freckled reddish-grey above, dull white or yellowish below. Hands and feet grey. Tail short-haired, the tip black. Head and body five inches, tail three and a half inches. West and North Australia.

Genus Dasyuroides.

Form comparatively stout. Tongue not extensile. Ears moderate. Tail long, fairly thick. Feet long and strong, toes with sharp curved claws; hallux absent; soles very hairy, pads with faint transverse striations. Pouch very slightly developed; mammæ 6. Terrestrial, burrowing. Insectivorous.

Byrne's Pouched Mouse.

Dasyuroides byrnei.

Size rather large, form stout and strong. Fur soft and close, mainly composed of the under-fur. Ears moderate, rounded, naked above. Above grizzled grey with a faint rufous tinge, under surfaces and hands and feet white. Tail rufous-coloured in the proximal half, while the distal half is thickly covered all round with long black hairs, which form a well-marked crest. Head and body seven inches, tail over five inches. Living in burrows on sandy and stony tablelands in Central Australia. Nocturnal in its habits.

Genus Dasyurus.

Marten-like animals with spotted bodies. Ears long and narrow. Feet plantigrade, with subequal toes, provided with sharp curved claws. Tail long, evenly and thickly haired throughout. Pouch opening vertically downwards. Mammæ six or eight. Terrestrial and arboreal; carnivorous and insectivorous.

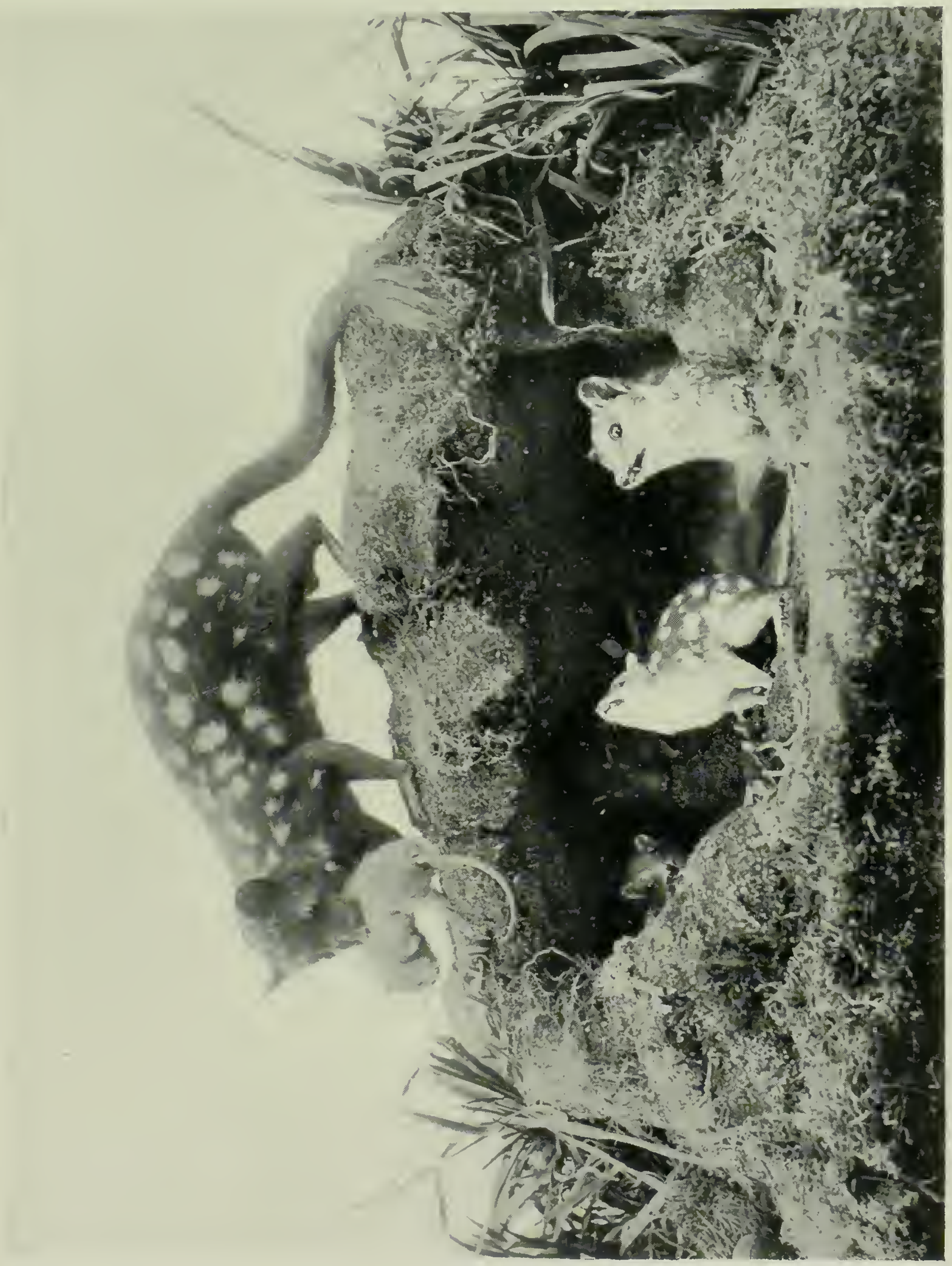
Key to the Species.

1. Tail unspotted.	2
Tail spotted.	4
2. Hallux present.	3
Hallux absent.	D. viverrinus.
3. Head and body 11 inches.	D. hallucatus.
Head and body 16 inches.	D. geoffroyi.
4. Head and body 13 inches.	D. gracilis.
Head and body 25 inches.	D. maculatus.

The North Australian Native Cat.

Dasyurus hallucatus.

Fur short and coarse. Ears large, thinly covered with fine yellow hairs. Above yellowish-brown spotted with white, below pale grey or yellow. Tail long, rather short-haired, the base of the body colour but unspotted, the remainder black. Hallux present. Mammæ eight. Head and body eleven inches, tail eight inches. Tropical Australia.



Lair of the Common Native Cat.

Austr. Mus.

Geoffroy's Native Cat.

Dasyurus geoffroyi.

Fur thick and soft. Ears large, their backs brown with white margins. Rufous olive-grey above, with white spots; below white. Tail long and rather bushy, the basal half above and fourth below of the body colour but unspotted, the rest black. Hallux present. Mammæ six. Head and body sixteen inches, tail twelve inches. All Australia except the extreme North and the coastal districts of the South-east.

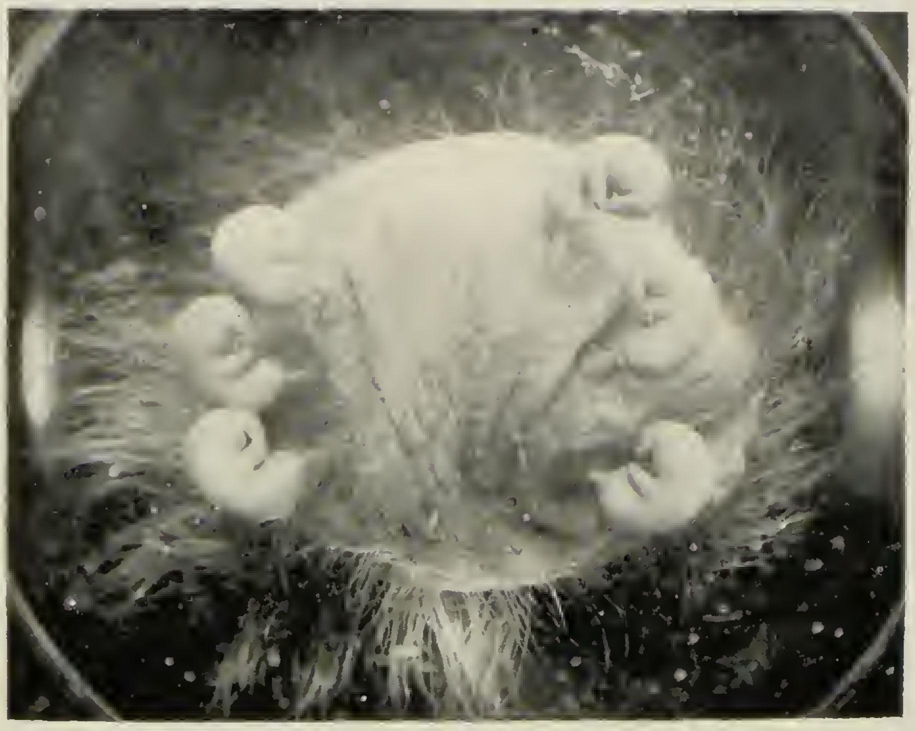


Photo. by Prof. J. P. Hill.

Young of Native Cat in Pouch.

The Common Native Cat.

Dasyurus viverrinus.

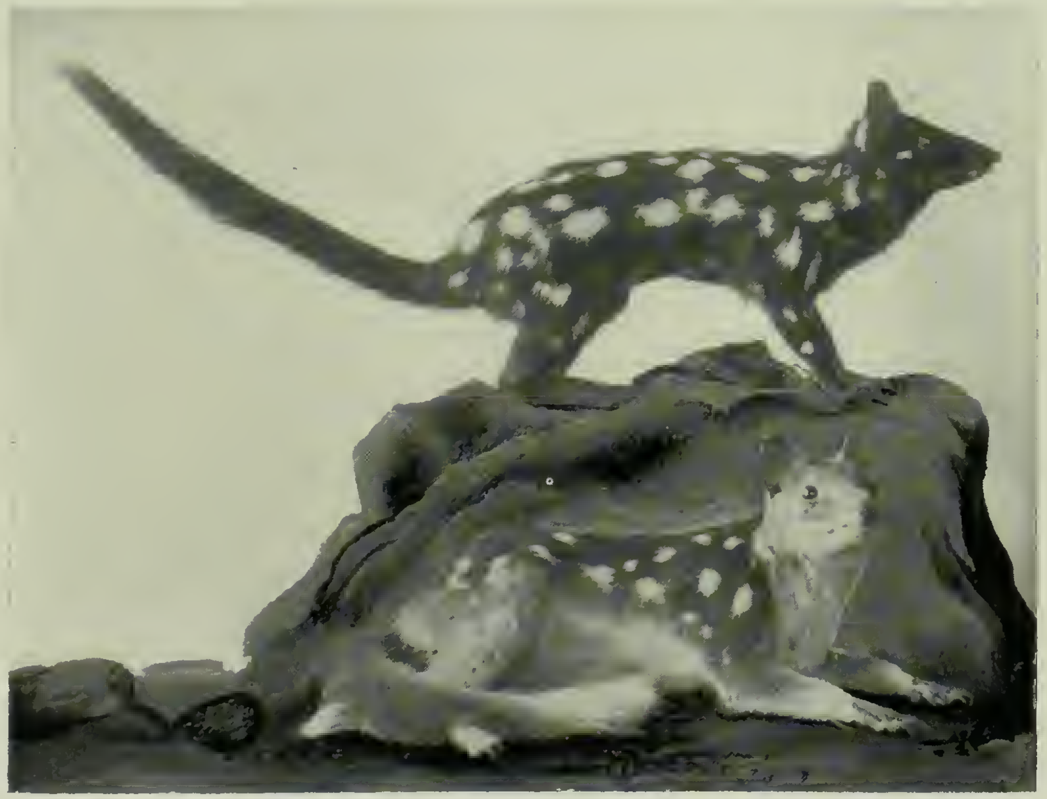
Fur thick and soft. Ears large. General colour above and below, either pale grey or black, with white spots. Tail bushy, the proximal three-fourths like the back, but unspotted, the tip white. Hallux absent. Mammæ six. Head and body eighteen inches, tail twelve inches. Eastern New South Wales, Victoria, South Australia, Tasmania.

The light-coloured form is much the commoner, though the black is not unfrequent. The species is as much terrestrial as arboreal. It will live in the roof of the settler's hut, and plays havoc with his poultry, coming out at night and raiding vigorously. In the bush they live in dead logs or under rocks, and by the seaside in holes in the cliffs, in this case "feeding on dead fish, and are not unfrequently caught in bated fish traps left bare by the tide or hauled up during bad weather."

The Slender Native Cat.

Dasyurus gracilis.

Fur short, close and rather harsh. Ears rather short. Above deep blackish-brown, spotted with white. Tail long, the terminal ends tufted, coloured like the body. Hallux present. Mammæ unknown.



Native Cat—Black variety and type. *Macleay Mus.*

Head and body thirteen inches, tail nine and a half inches. A single specimen only known, obtained in the Bellenden Ker Range, North Queensland.

The Great Spotted-tailed Native Cat.

Dasyurus maculatus.

The largest of the Cats, form stout and heavy. Fur thick and close. Ears rather short and very thinly haired. Above dark reddish—or orange-brown, never black, with large white spots; below white or pale yellow. Tail very long, brown, spotted like the body. Hallux present. Mammæ six. Head and body twenty-five inches, tail nineteen inches. From Central Queensland to Victoria, principally on the Ranges, but extending to the coast-line, Tasmania.

The most arboreal of the Native Cats, hence not in competition with the Dingo.

Genus Sarcophilus.

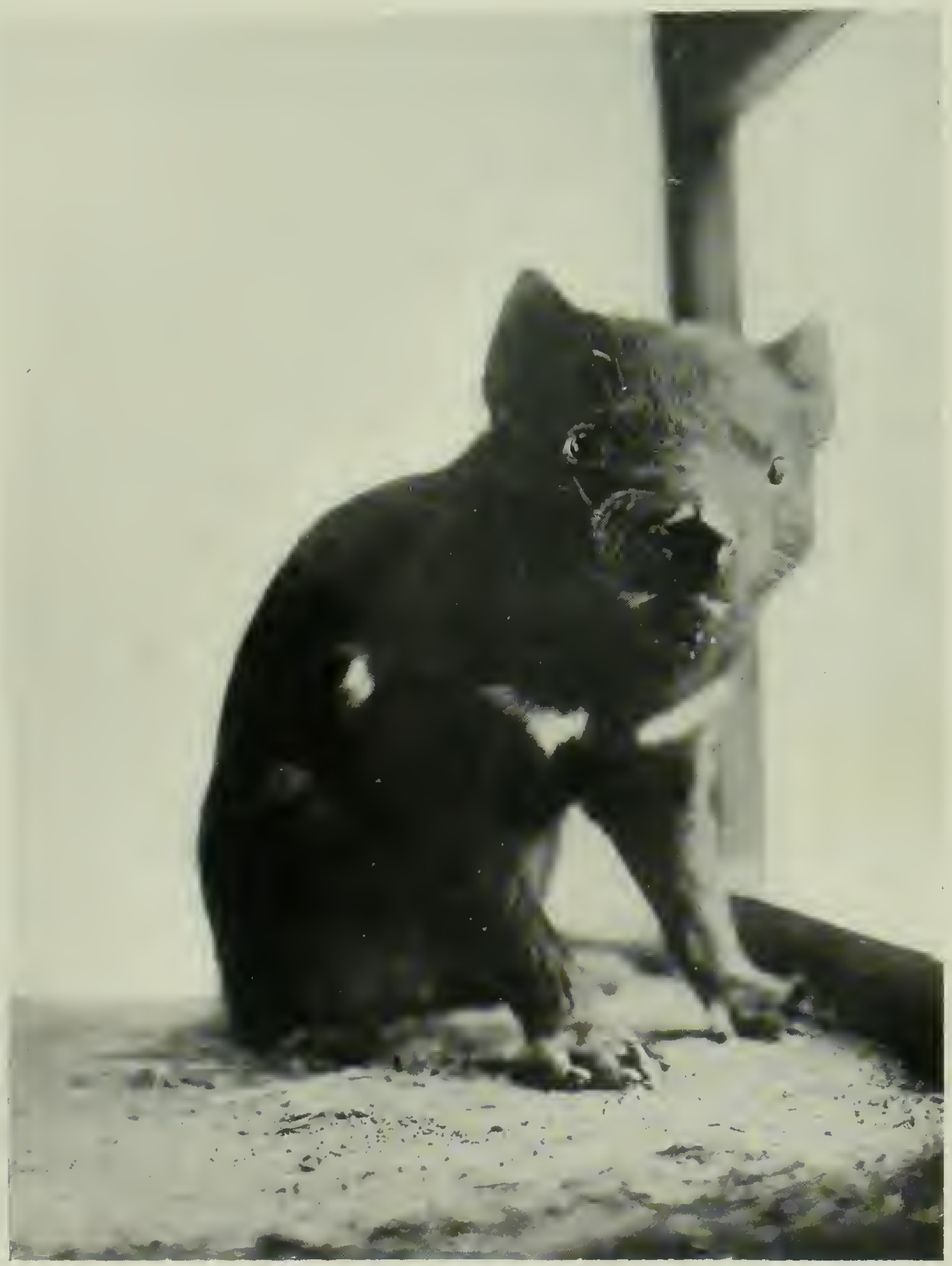
Form very stout and powerful, like a small bear. Muzzle short and broad. Ears broad and rounded. Tail moderate, evenly hairy. Feet plantigrade; toes subequal, with strong curved claws, hallux absent. Terrestrial, carnivorous.

The Tasmanian Devil.

Sarcophilus ursinus.

Fur thick and close, consisting largely of woolly under fur. Ears hairy with well-marked basal tufts. Colour jet-black with a white horse-shoe mark on the chest, and a white patch at the base of the back, but they have often other irregularly placed blotches of white, perhaps indicating partial albinism. Tail short, uniformly thickly hairy. Head and body twenty-eight inches, tail twelve inches. Confined to Tasmania.

When Tasmania was first settled, the Devil was common, and preyed extensively on the poultry and the sheep, but now it has been driven back to the very roughest country. It is a powerful but sluggish beast, but so fierce and provided with such strong canine teeth that it is more than a match for any ordinary dog. The whole dentition is pronouncedly carnivorous, and the animal bites severely, while the molar teeth enable it to crush the largest bones with ease. Being slow in movement, like the Bear, it captures its prey by a sudden spring, and will then eat it greedily, bones and all. It will come down to the seashore, and devour dead fish or any other edible jetsam. Its voice is a disagreeable hollow bark, varied by an occasional still more disagreeable snort. In captivity its retains its ferocity, and is exceedingly quarrelsome. It usually has four young.

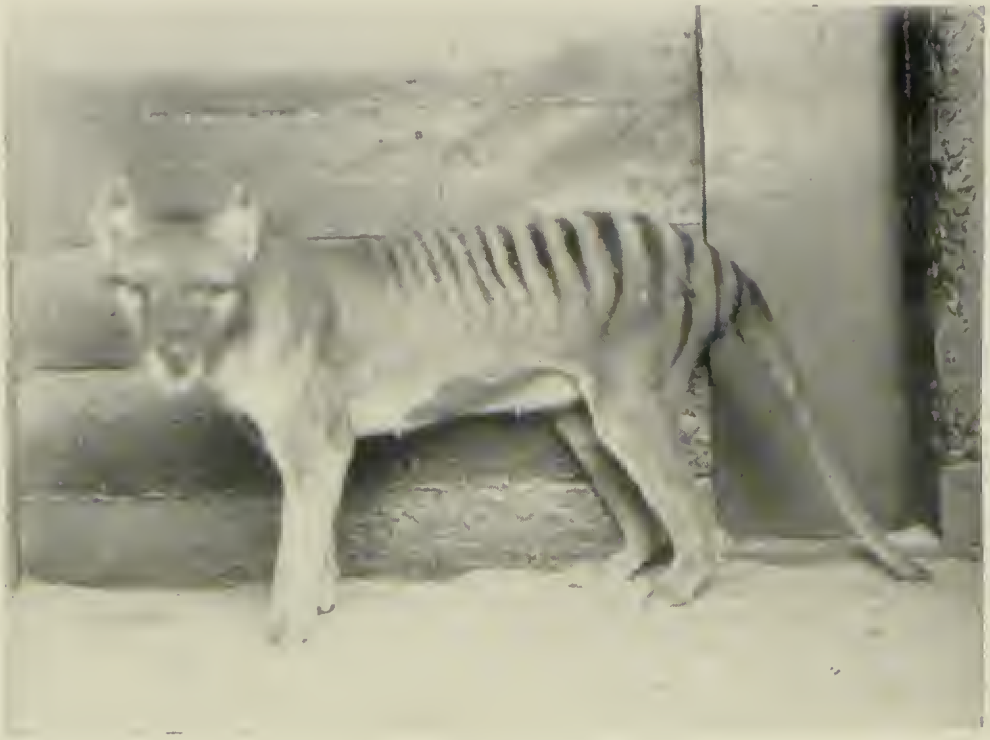


From life. J. B. Lane. *Melb. Zoo.*

Tasmanian Devil.

Genus Thylacinus.

Large and wolf-like. Muzzle long and slender. Ears of medium size. Tail long, short-haired. Feet markedly digitigrade. Toes subequal, with short, thick conical claws. Hallux absent. Pouch opening backwards. Mammæ four. Epipubic bones rudimentary.



From life. J. B. Lane. Tasmanian Wolf. *Melb. Zoo.*

The Tasmanian or Marsupial Wolf.

Thylacinus cynocephalus.

Fur short, close and crisp. General colour above a grizzled tawny grey, below paler; on the hinder part of the back about sixteen blackish-brown transverse stripes, continued on the tail and down the hind limb. Tail with blackish crested tip. Head and body forty-four inches, tail twenty-one inches. Confined to Tasmania.

This animal resembles in form and habit some of the short-legged Wolves. It is now very difficult to see or obtain, having been driven back to the roughest parts of Tasmania. Some twenty years ago the price of a "Tiger" was five pounds. During the day they lie quiet in caves, under rocks, or in hollow trees, and at night rise to hunt their prey. They have keen scent, but they have not great speed, and prefer to spring upon unsuspecting prey, whether the settlers' sheep or the native wallabies, rat-kangaroos, or other ground game. The cry is a rapidly-repeated kind of cough.

Family Peramelidae.

The Bandicoots.

Teeth numerous (48). Clavicles absent. Hind limbs the longer. Fore feet with two or three of the middle digits long and clawed, the others rudimentary; hind feet with four or five very unequal toes, hallux rudimentary or wanting, second and third toes slender, united, fourth longest with a large claw, fifth smaller, clawed. Pouch present, opening backwards. All are ground animals, burrowers, and omnivorous.

Key to the Genera.

1.	Fore feet with only two toes fully developed, the first and fifth wanting.	Chœropus.
	Fore feet with the three middle toes long and fully developed, the first and fifth rudimentary.	2
2.	Tail tapering, short-haired or naked.	Perameles.
	Tail long, conspicuously crested behind.	Peragale.

Genus Choeropus.

Muzzle short and narrow. Ears prominent, long and narrow. Hind foot with fourth toe remarkably developed, rest small, hallux wanting. Tail cylindrical, with a crest of longer hairs on the dorsal half.

The Pig-footed Bandicoot.
Choeropus castanotis.

Form delicate. Fur coarse and straight. Ears thinly-haired, dull chestnut-brown behind, darkening towards the tip. Limbs very slender. Dorsal surface of a light, almost orange-brown, colour, sometimes darker; the ventral surface of a light fawn colour. The tail is dark brown above, lighter below. Head and body about ten inches, the tail to more than half as long. The inland parts of New South Wales and Victoria, South, West, and Central Australia.

Sir Thomas Mitchell, who first met with this now rarely seen Bandicoot on the banks of the Murray, describes it as active and a hunter of insects. He compares the narrow snout projecting from the broad head to the narrow neck of a wide bottle. The reduction of the digits of the feet has proceeded further than in any of the other members of the family, there being only two functional fingers, and one relatively enormous toe, on the ball of which the animal apparently steps. Spencer obtained two specimens from the Centre, one of which was dug out of a hole in a sandy plain by a native black woman.

Genus Perameles.

Muzzle long and pointed. Hind foot with the hallux short and clawless, the second and third toes with flat twisted nails, the fourth long and powerful, with a stout pointed claw, and the fifth similar but smaller. Tail tapering, short-haired or nearly naked.

Key to the Species.

1.	Fur not spinous. Light vertical bands on the hind-quarters.	2
	Fur spinous. No bands.	3
2.	Tail nearly half as long as head and body.	P. bougainvillii.
	Tail not a quarter as long as head and body.	P. gunni.
3.	Ears long, narrow and pointed. Fur slightly spinous.	P. nasuta.
	Ears short and round. Fur spiny.	4
4.	Tail rather long.	P. macrura.
	Tail rather short.	P. obesula.

The Western Striped Bandicoot.

Perameles bougainvillii.

Small. Form light and slender. Fur coarse. Muzzle long and slender. Ears long, narrow, pointed, reaching, when laid forward, beyond the eye. Grizzled olive-grey above, with ill-defined light stripes on the sides of the rump, white below. Head and body nine inches, tail a little over four inches. West Australia.

An Eastern variety, var. *fasciata*, shows better defined and more conspicuous stripes, and a greater contrast in the dark and light patches on the back of the ears.

The Tasmanian Striped Bandicoot.

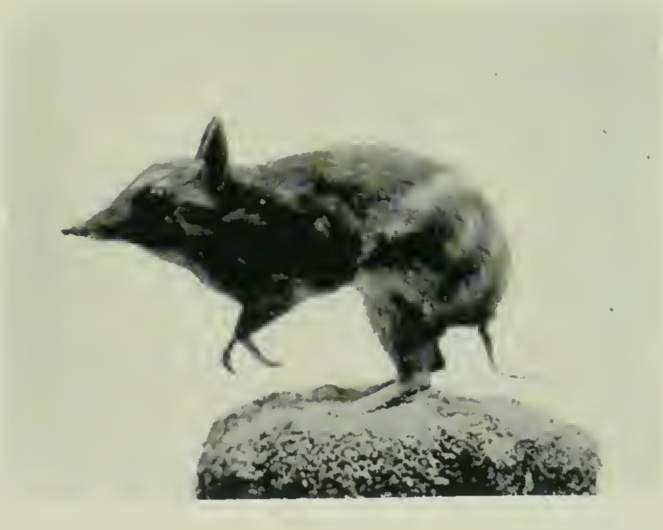
Perameles gunni.

Large. Form slender. Fur rather soft. Muzzle long and slender. Ears long and pointed, reaching, when bent forward, beyond the eye. Grizzled yellowish-brown above, white or yellowish white below; four vertical light bands on the sides of the rump. Tail very short, slender, mostly white. Head and body sixteen inches, tail four inches. Tasmania and Victoria.

The Long-nosed Bandicoot.

Perameles nasuta.

Large. Form slender. Fur coarse, hispid, slightly spinous. Muzzle very long and slender. Ears long, narrow, and pointed. Dark olive-brown above, white below. Tail brown above. Head and body sixteen inches, tail five inches. Eastern Australia.



Austr. Mus.

Tasmanian Striped Bandicoot.

The North Australian Bandicoot.

Perameles macrura.

Large. Form stout. Fur short, coarse and spiny. Ears short and broad. Above coarsely grizzled yellow and black, white or yellowish below. Tail long, brown above, white below. Head and body sixteen inches, tail seven inches. North Australia.

The Golden Bandicoot.

Perameles aurata.

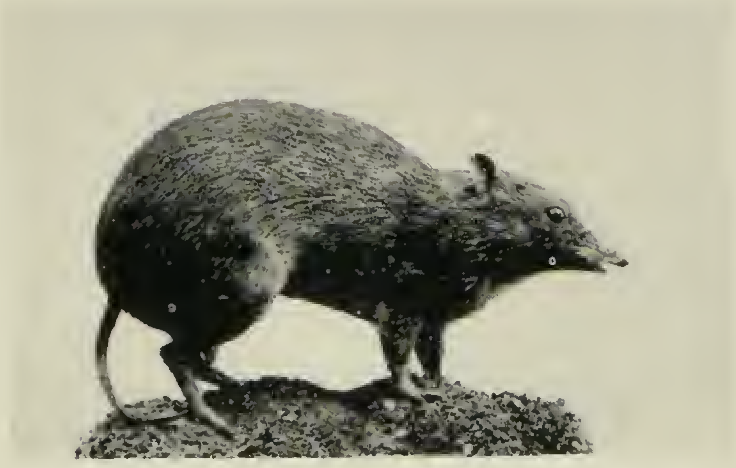
Small. Form rather stout. Fur coarse and spiny. Ears short and broad. Above rich golden-brown, pencilled with black; below white. Head and body eight and a half inches. North-western Australia.

The Short-nosed Bandicoot.

Perameles obesula.

Rather large. Form stout. Like *P. macrura*, but lighter in colour and the tail proportionately shorter. Head and body fourteen inches, tail five and a half inches. Australia south of the Tropics, Tasmania. The most widely distributed species.

The Bandicoots prove trying to settlers in virgin country, as they do great damage to roots and all ground crops, making quick work with a large setting of potatoes. They will also feed on the earth worms, so useful in tilled ground. They feed in the evenings and at night, and, in districts where they are plentiful, the ground is riddled with the small holes which they make in search of edible roots. They are best hunted by the aid of terriers, who capture them or drive them into hollows from which they may be persuaded into bags held in front.



Perameles obesula. *Austr. Mus.*

Genus Peragale.

Muzzle long and narrow. Ears very long. Hind limbs much longer than the fore. Tail long, conspicuously crested on the latter half.

The White-tailed Rabbit Bandicoot.

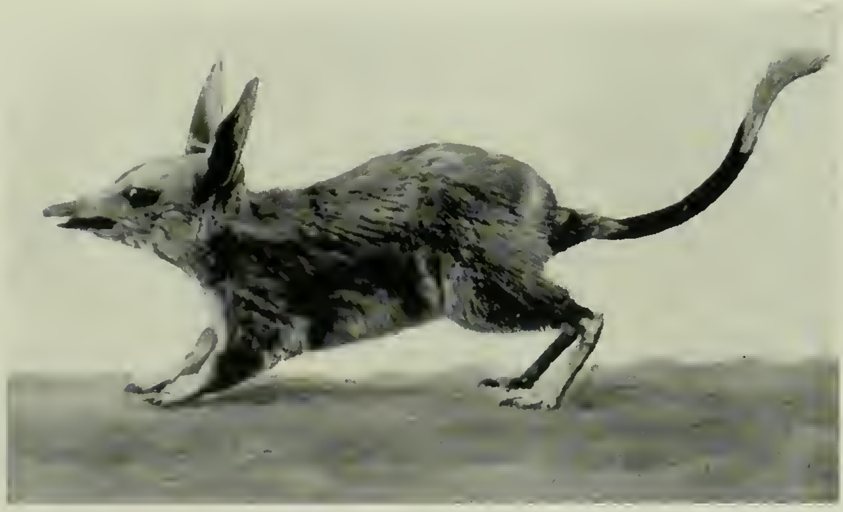
Peragale leucura.

Small and slender. Fur long, soft and silky. Above fawn-coloured, below white. Limbs and tail white. Dimensions and locality unknown.

The Common Rabbit Bandicoot.

Peragale lagotis.

Large. Form light and delicate. Fur very long, soft and silky. Above fawn-grey, below white. An indistinct darker vertical band on the side of the rump. Tail thickly hairy throughout, at the base fawn-grey, in the middle third black or dark brown, and the terminal third white and prominently crested above. Head and body eighteen inches, tail half as long. Central, South, and West Australia.



Rabbit Bandicoot. *Austr. Mus.*

Spencer remarks that the Rabbit-Bandicoot is still not uncommon in the Centre, judging from the number of tails used by the natives as ornaments. They tie the white terminal tufts together in bundles of from twelve to twenty. The animal is of about the size of the common rabbit, and like the rodent is a burrower, but feeds chiefly on insects, especially the larvæ which it finds about the roots of the mulga. Its flesh is sweet, and much prized by the natives.

Sub-class Prototheria.

Monotremes.

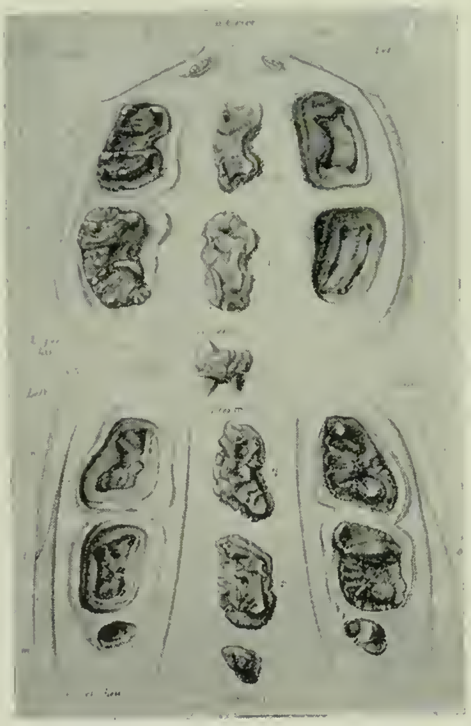
Oviparous; the mammæ not provided with distinct teats; a temporary pouch in which the very young are carried; the milk pressed out by the special muscles of the mother; epipubic bones present; adults not provided with true functional teeth. No corpus callosum in the brain.

The Monotremes or Egg-laying Mammals are confined to two families, of which the first contains but one genus, highly specialised for an aquatic life, and for feeding on food found in the soft mud in the banks and floor of the streams, and the second includes two closely allied genera, highly specialised for a roaming life and for feeding on ants. The Platypus (*Ornithorhynchus*) is our sole representative of the first family, and the Porcupine Anteaters (*Echidna* and *Pro-echidna*) are all that are left to represent the second. Both Platypus and Echidna are adapted for burrowing, the one in the banks of the streams in which it lives, the other in the surface of the rocky hills or of the dense scrubs amongst which it finds its food.

The Monotremes are the most primitive of living Mammals, and are separated from the Marsupials by a much wider structural gap than are these latter from the remaining Mammals. Further, the egg-laying habit of the one and the pouch-bearing character of the other are features so peculiarly distinctive as to entirely justify zoologists in regarding each of these orders as constituting in itself a sub-group equivalent to that which includes the whole of the nine orders of the Higher Mammals.

The Mammals are warm-blooded animals, which maintain a fairly constant body-temperature no matter how the external temperature may vary. Platypus and Echidna are also warm-blooded, but Sutherland found that the average body temperature is some 14 degrees lower than that of other mammals. In addition the Monotremes are much more markedly affected by changes in the external temperature than are the ordinary mammals. On a warm day their temperature goes up; on a cold day it goes down; though this variation is not nearly so marked in them while in an active state as it is in the Reptiles. It is said, however, that in the hibernating state, the temperature of Echidna is only a fraction of a degree above that of its surroundings. In this condition Echidna behaves exactly like a cold-blooded reptile, in which the body temperature is not constant, but is directly dependent on that of the surrounding air.

In the young Platypus—a foot in length—true teeth are present in the back part of the jaws, which are functional for a short time, but are soon worn down and eventually shed. As they become reduced, the surface of the gums below and around the teeth becomes hard and cornified to form the crushing plates present in full-grown specimens. There are two teeth in each ramus of the upper jaw, and three in each of the lower jaw. They are oblong, relatively broad, and flattened so that they project very little above the level of the jaw. The free surfaces or crowns are rendered rough by a series of pointed cusps of varying size. These multicuspidate teeth recall the teeth of the extinct *Prototheria*, the *Multituberculata*, such as Tritylodon. Owing



Drawing Prof. J. P. Hill.

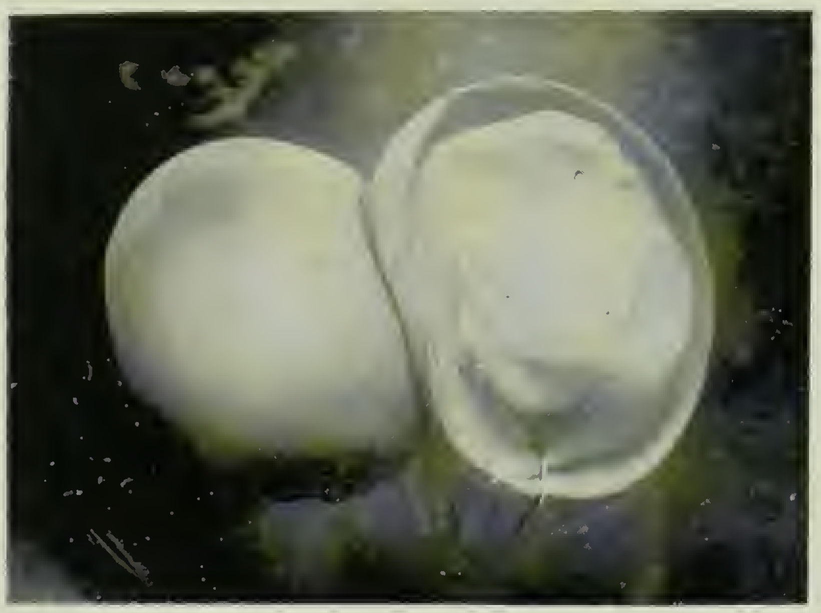
Teeth of Platypus.

doubtless to the extreme specialisation of the living Prototheria there has been a marked degeneration in their dentition. In the *Multituberculata* incisors, canines, pre-molars, and molars were all well developed, and functional throughout life. In Platypus there has been a loss of all but the molars, and even of these in the adult, while no teeth are present in the jaws of Echidna, even in the young stage.

In the Higher Mammals, *e.g.*, in Man, there are only two bones on either side of the body which are concerned in giving attachment to the arm, the collar bone or clavicle in front and the blade bone or scapula behind. The apex of the scapula is hollowed out into the glenoid cavity into which fits the head of the single bone, the humerus, of the upper arm. A small hook-like projection, the coracoid process, arises from the scapula and overhangs the cavity. This coracoid process develops quite independently of the scapula, and is actually formed by the union of two quite small independent bony elements. In the Monotremes the clavicle and scapula are present in the same positions as in Man, but in place of the small coracoid process, there are two bones stretching across from the scapula to the breast-bone, the coracoid with the epicoracoid running in front of it. The arch is completed on the chest side by a T-shaped bone, the interclavicle. There are thus nine bones in the arch in place of four, as in Man. To parallel this arrangement of bones in the shoulder girdle we have to go to the Reptiles, and to an extinct group of Reptiles, the Theriodonts, such as *Cynognathus* of the Permo-Triassic. In these all the elements of the girdle are present as in the Monotremes, and in them too the teeth are singularly like those of Mammals. Thus it would seem that the Prototheria originated from a reptilian stock, such as the Theriodonts, and it is incidentally interesting to find that the coracoid process in Man is the vestige of the coracoid and epicoracoid bones of the primitive mammals.

The Platypus and Echidna both lay eggs like Reptiles or Birds. The female Platypus lays from one to four eggs. These are deposited in a rude nest made of grass and leaves and situated in the terminal enlargement of the burrow. In the case of Echidna only one egg is usually laid at a time.

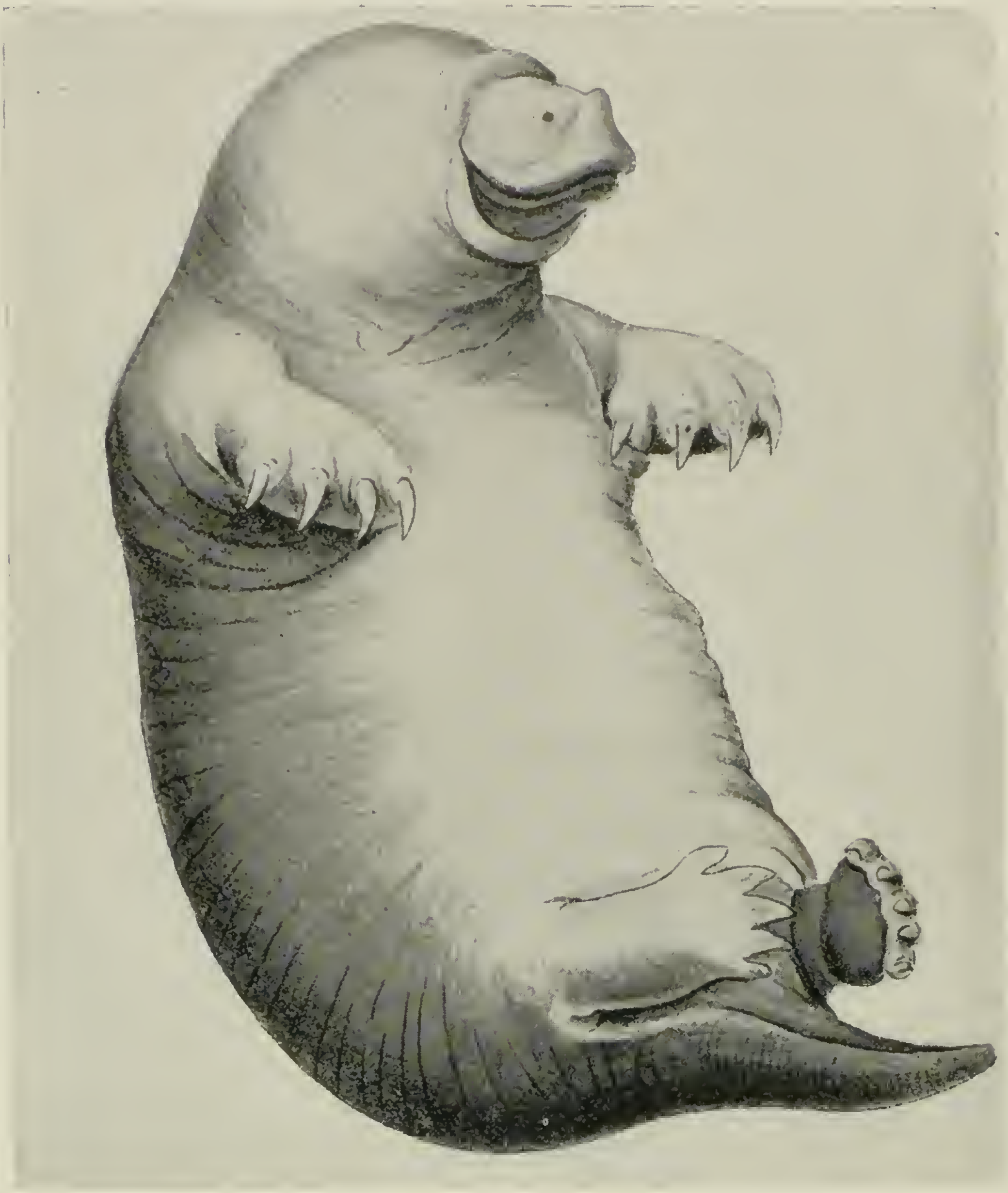
Unlike Platypus, the female Echidna develops a temporary pouch at the laying season, and into this the egg is transferred. In the pouch the egg is incubated, and therein the young hatches out. In both, the eggs are of large size compared with the ova of ordinary mammals, measuring about five-eighths of an inch in the longer diameter. They are rather oval in form, and dirty-white in colour. As in Reptiles, the egg is inclosed in a thick resistent outer coat or shell. This contains only a small amount of carbonate of lime, and is thus not brittle, but tough and leathery.



Egg of Platypus. *Photo. Prof. J. P. Hill.*

In no other Mammals is an egg laid and the young developed entirely externally to the body of the parent. The ovum of the Platypus when it commences to develop inside the body of the parent is even then one-fifth the size of the laid egg, twelve times the size of the ovum of the Native Cat, and eighteen times that of the Rabbit. In the Marsupials it is to be noticed that there is a thin shell round the relatively minute ovum. In the lizards the egg laying habit is developed in very different degrees in the different species.

The egg is large owing to the presence of a food yolk, absent in the minute ova of Higher Mammals. There is an air sac as in other yolk-bearing eggs. The young just hatched is three-fifths of an inch long, and is at about the same stage of development as the young chick in a hen's egg after three days' incubation. It has a special projection, the egg-breaker on the top of its snout as in all Birds and many Reptiles. In the newly-hatched Platypus the face is not elongate but flattened.



Embryo of Platypus. *After Hill and Wilson.*

The mammary glands are in two tuft-like groups attached to and underlying the skin of the under side. They do not open by nipples but by a number of small pores or two circumscribed areas on the external surface in Platypus, and into the pouch in Echidna. The milk is forced out by the contraction of the ventral muscles; and the young applies its flat face to the lacteal surface, and imbibes its nourishment. The young Platypus remains in the nest until it is about six inches long. It has then gained its furry coat and is able to fend for itself. The young Echidna is carried in the pouch till from three to three and a half inches long. It is then said to be deposited in a hollow of the ground and to be fed by the mother at intervals. Most of our information in regard to the development of the Monotremes is due to Professors Hill and Wilson. Professor Hill has given us generous assistance in drawing up our account of the group.

Genus Ornithorhynchus.

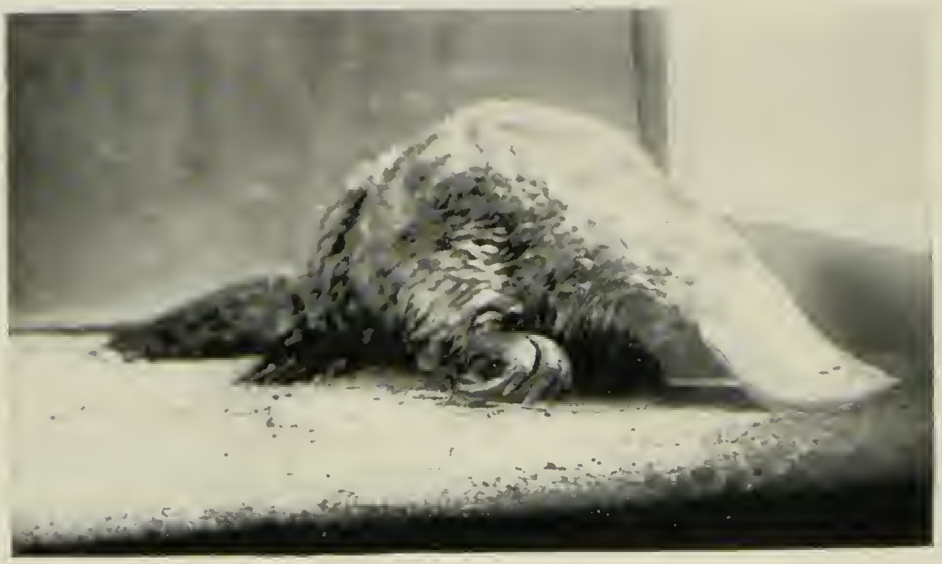
Form elongated and depressed. Muzzle in the shape of a broad flattened beak. Tongue not extensile. True teeth present in the young. Fur short, dense and velvety, without spines. Tail large, broad and flattened. Hands and feet modified as swimming organs, the five digits in each united by a web, and provided with long claws. Cerebral hemispheres smooth.

The Platypus.

Ornithorhynchus anatinus.

Male much larger than the female. Above deep umber or blackish-brown, below greyish-white; a white or yellowish spot round the eye. Tail above coloured like the back, usually naked below. Bill black above, yellow and black below. There is a sharp movable spur on the heel, especially developed in the adult male. Head and body of male eighteen inches, tail six inches; of female fourteen inches and five inches. In calm reaches of the streams, where the banks are steep and shaded, and where water weeds grow in profusion, in Central and Southern Queensland, New South Wales, Victoria, South Australia, and Tasmania.

Of a timid and retiring disposition, the Platypus is still to be found in many of the rivers and creeks of South Eastern Australia and Tasmania. It is best seen exercising and feeding either in the early morning or in the evening at sunset. In dark, rocky shady rivers they may be seen in the daytime, but they avoid exposing themselves to direct sunlight. The Platypus is an accomplished swimmer and diver. His movements while in the water are astonishingly quick. Though he has no external ears he is gifted with an acute sense of hearing, and at the slightest suspicious sound, down goes his head and he disappears in a flash, circular ripples alone remaining to show where he has been. He is thus little likely to fall a victim to any natural enemies, such as the birds of prey, and might linger long in our streams if unpersecuted by man, or uninjured by interference with his watercourses.



From life. Platypus in progression. *Melb. Zoo.*

The New South Wales Government has wisely placed the Platypus under absolute protection for a term of ten years, and the Victorian Government continuously, so we may hope that his tenure of existence may at least be considerably prolonged.

The Platypus seldom ventures on the dry land, and apparently only when migrating from one pond to another, and is then distinctly out of his element. His short legs are insufficient to raise the body above the ground, and so he crawls along by means of his claws, with the web folded backwards out of the way, very much after the fashion of a lizard.

The most striking feature of this quaint looking creature is undoubtedly the duck-like bill or beak, on account of which it has been called the Duck-Mole. Although superficially much like that of the duck, it is structurally very different. In the duck the skin covering the bill is hard and horny, in the Platypus it is soft and extremely sensitive. The entire structure is admirably adapted to the needs of an aquatic animal which obtains its food by grubbing for it in the soft mud of the river bank. The Platypus feeds almost entirely beneath the surface of the water, practically in the dark, so that its small eyes are of little use to it. It gropes about in the mud with its flattened bill, and depends for the finding of its food largely on the sense of touch. Hence the importance of the very sensitive skin on the bill. This skin contains numerous special touch-organs which are supplied by branches of the two largest nerves which leave the brain.

Further adaptation to its aquatic life are the short dense, velvety fur of the skin, and the broad flat tail, while the five toes of each limb are connected together by a broad web. To aid the animal in its burrowing habit the eyes are greatly reduced and inconspicuous, external ears are quite absent, the legs are short and all the toes are furnished with digging claws.

The home of the Platypus is a long narrow tunnel-like burrow, which begins with an entrance under the surface of the water, and then runs obliquely upwards in the bank for a distance of 20-50 feet. It eventually terminates in a rounded chamber or living apartment, lined with grass and leaves, and situated not very far below the surface of the ground. Very often the main burrow gives off at intervals lateral branches also terminating in chambers. Sometimes the burrow is provided with an additional opening above the level of the water, though this is certainly not always present.

The food of the Platypus consists of aquatic insects, worms and small shell-fish such as the river-mussels. These it obtains by diving to the bottom of the pool, and searching about in the mud with its sensitive bill. Any food so obtained is necessarily covered with a certain amount of gritty mud or sand. It is not directly swallowed but is stored up temporarily in enlargements of the cheeks, in cheek-pouches such as we find in some of the monkeys. When these receptacles are filled the Platypus ascends, and chews his food leisurely as he swims about the surface. The mastication of this gritty hard food is effected, not by means of true teeth, but by two sets of hard horny plates, which occupy the position of teeth on the front and back parts of the jaws. From the nature of the food it is obvious that flat horny plates are much more efficient than brittle calcified teeth, and they are more easily renewed by growth from below. They do not live long in captivity.

Genus Echidna.

Form stout and depressed. Muzzle in the shape of a long slender beak. Tongue long and extensile, with spines on the back, as also on the palate. No true teeth in any stage. Fur mixed with stout spines. Tail rudimentary. Limbs short and strong. Toes not webbed, provided with digging claws, those of the fore limb broad and directed forwards, those of the hind limb slenderer and curved outwards, that of the hallux short, blunt and rounded. Cerebral hemispheres convoluted.

The Echidna or Native Porcupine.

Echidna aculeata.

There are three varieties or geographical races: var. *typica* found all over Australia; var. *lawesii* in South Eastern New Guinea; and var. *setosa* in Tasmania.

1. *typica*—General colour of the hair black or dark brown above, brown below. Spines of the back long and stout, generally quite hiding the hair, yellow with a black tip. Length about seventeen inches.

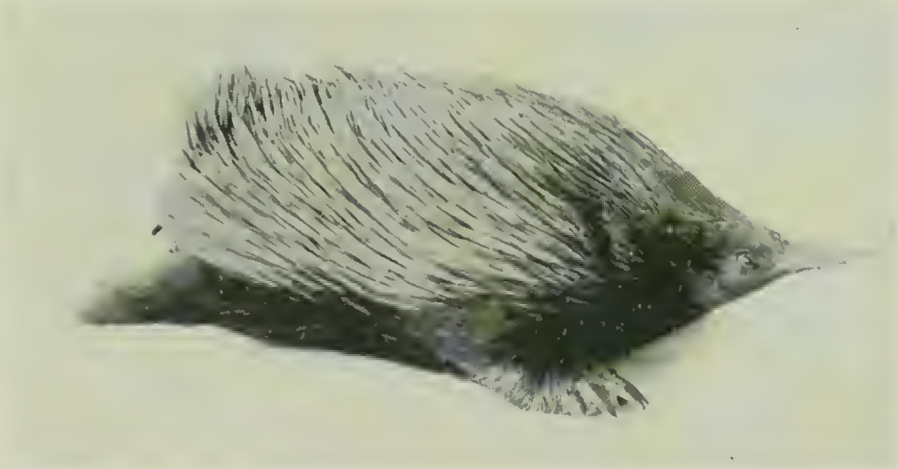
2. *lawesii*—Colour as in var. *typica*. Spines shorter. Length about fourteen inches.

3. *setosa*—Colour as in var. *typica*. Hair longer, almost concealing the spines. Length twenty inches.

There is thus a gradual increase in size from North to South. There is no marked difference in the size of the sexes.

In the genus *Pro-echidna* of New Guinea the toes of each foot are three in number, instead of five as in *Echidna*.

The Echidna is totally different in external appearance to the Platypus, and it is only on dissection and by the study of the development that their relationships are made evident. The Echidna is adapted to a totally different kind of life. It roams over the ground of rocky or of forest country. It is met with at times in the daytime during the summer, but, like the Platypus, is most active at the beginning and end of the day. Its most striking feature is the armour of stout sharp spines which are thickly mingled with the hair. It is from the presence of these spines that the animal derives its names of Australian Hedgehog or Australian Porcupine. When surprised or interfered with the Echidna simply rolls itself into a spiny ball, with the head and legs tucked in below, and so presents a most uninviting object for attack. He can be handled, however, by seizing one of the projecting toes of the hind foot, and can then be carried by the foot with the head hanging down.



Echidna. *Syd. Techn. Mus.*

It is altogether a much more powerfully built and more muscular animal than the platypus. Its limbs are especially strong, and the toes of the hind limbs are provided with massive curved claws, a combination forming remarkably effective digging organs. So inveterate a digger is the Echidna that a pen with a concrete floor forms the only really safe enclosure. So strong is he that, when once he has established himself in a corner, a crowbar or a spade is necessary to effect his removal. And, in the bush, when once he has seriously begun to burrow it is generally impossible to dislodge or unearth him with such ready-made appliances as may be at hand. Like the Platypus he is shy and timid. When disturbed he takes alarm at once, and gets below the surface of the ground in a marvellously short time. The burrowing habit may be in part connected with the search for food, but the animal makes use of the power to escape from its enemies, and also in winter time when it hibernates.

In adaptation to the habit of feeding on ants the head is drawn out into a long cylindrical snout, terminating in a very small mouth. The tongue is elongated, very slender, and capable of being protruded for a considerable distance. The jaws are slender and entirely destitute of teeth of any kind, and no trace of them has been found in the young. The palate, however, and the back of the tongue are rough with small spines, presumably to hold the living prey. For ants and their eggs form the staple food, and these the Echidna obtains by digging up the ant or termites' nests with his powerful limbs. Then the tongue covered with a sticky saliva is protruded; it becomes covered with ants, and is then quickly drawn back into the mouth.

From life. Echidna. *T. Steel.*

Although dull and stupid during the day, the Echidna wakens up at night, and then becomes quite lively. If in confinement it is then that he most acutely realizes it, and makes his most desperate endeavours to escape. If you are successful in keeping him from getting away, you will find that he takes readily to such food as bread and milk which he licks up as he does the ants by the rapid protrusion and retraction of the tongue.

The spur on the heel was supposed to be venomous, and from this the name Echidna (adder) was conferred upon the animal. There is no venom, however, and the name is therefore in no respect a happy one.

REPTILIA.

Cold-blooded animals breathing air direct by means of lungs: skin usually covered with scales; skull jointed to the backbone by a single condyle: the young born free or hatched from eggs, independent of the parents.

ORDER OPHIDIA.

Reptiles with elongated cylindrical bodies, covered over with an integument bearing horny scales. Gape greatly extensible owing to the presence of a loosely attached quadrate bone, and the loose articulations of the various bones of the jaws. Ribs numerous; no sternum. Limbs altogether absent or, in the Pythons, vestiges of the hind limbs discernible externally. Eyelids absent. Teeth conical, hooked, not lodged in distinct sockets. Entirely carnivorous.

Locomotion.—Some snakes, the blind ones, live underground; the majority move rapidly along the ground; a few climb trees and move about the branches; and a number are almost entirely aquatic, living in rivers or in the sea. None of them possess functional limbs, and hence they must rely upon other means of progression. The water snakes are usually flattened vertically, and the tail is expanded in the same direction; hence they are able to swim elegantly in lateral undulations, effected by the muscles, the tail more particularly working as a propelling paddle. The sea snakes, indeed closely resemble the eels in their movements, and as most of them are extremely venomous, this resemblance to the brightly coloured but harmless eels of the Tropics may be highly dangerous. Most of the land snakes, too, though less distinctly adapted to the purpose, will take to the water and swim well with the head and neck well above the surface. The method of progression by which the land snakes glide and curve along the ground, or make their way up the trunks of trees, is on the other hand quite unique. The body to begin with is extremely flexible, each vertebra moving freely upon the next, to which it is articulated by a cup and ball joint, the body of each vertebra being hollowed out in front into a nearly hemispherical socket into which fits the correspondingly shaped backward convexity of the vertebra which precedes it. The number of the vertebræ, and therefore of these joints is very great, in some of the large Pythons more than four hundred. Most of these vertebræ carry ribs, and in those of the tail, which do not, the place of the ribs is taken by elongated transverse processes. These ribs and processes are attached below to the broad transverse plates of the under surface, the free edges of which point backwards. Thus in place of two pairs of limbs which find a purchase by means of the feet we have a very large number of pairs of ribs which find a purchase by means of the ventral scales. "On thy belly shalt thou go." But this is not all, for the motion is sinuous, and the bends of the body assist the advance. The classical explanation of the various movements has been given as follows by Dr. Günther: "Although their motions are in general very quick, and may be adapted to every variation of ground over which they move, yet all the varieties of their locomotion are founded on the following simple process. When a part of their body has found some projection of the ground which affords it a point of support, the ribs, alternately of one and the other side, are drawn more closely together, thereby producing alternate bends of the body on the corresponding side. The hinder portion of the body being drawn after, some part of it finds another support on the rough ground or a projection; and the anterior bends being stretched in a straight line, the front part of the body is propelled in consequence. During this peculiar kind of locomotion the numerous broad shields of the belly are of great advantage, as by means of the free edgs of these shields, they are enabled to catch the smallest projections on the ground which may be used as points of support." The snake cannot glide over a glass or polished surface, since there are no roughnesses to serve as points of vantage, and there are no projections against which to press the sides. It can move readily over the bare boards of a floor or, over a floor covered with oil-cloth or linoleum. In its natural habitat, however, there is usually abundance of herbage, and when passing through thick grass the belly shields play but small part in progression: the snake moves in quick, sinuous curves, and locomotion is effected as in swimming, the grass affording the resistance which in aquatic progression is supplied by the water. The speed of some snakes is at times very great. A Black Snake will sometimes cross the track in front of you like a black flash, and everyone has noticed that if watching a snake he takes his eye off it for a moment, it has vanished in the twinkling. Still, if watched continuously, it is generally not difficult to overtake a snake in the open, and it is generally, on the other hand, possible to get away from one which is aggressive.

The Tree Snakes are expert climbers. They cannot certainly hang on by their eyelids, for they have none, but the scales doubtless serve the purpose, and in an astonishing manner they will make their way up the sides of a deep box, or surprise you by appearing upon the mantelpiece. Some have keeled scales, which no doubt assist in obtaining a purchase. It is difficult to capture a tree snake even on a low sapling. It will elude you in the tantalisingly easy way of the butterfly. It passes lightly across the small branches, and in and out among the foliage, and insinuates itself through apparently quite inadequate openings. In the Pythons and others the tail is prehensile, and so powerful are the muscles that the whole weight of the snake is borne by the single turn or less of the tail, the animal swinging freely and able to turn in any direction.

Of the underground *Typhlopidae*, or Blind Snakes, of which there are a large number in Australia, Mr. Waite, who made a special study of the family, writes: "The scales of these snakes are highly polished, so as to offer but little resistance to their passage through the soil. But, having no large belly plates with projecting edges, it will be evident that, without further aid, progression would be difficult; such aid is furnished by the tail. This member is very short, often no longer than the body is thick, and is provided with a horny, thornlike point directed downwards. On being pressed against the ground, this thorn provides the necessary point of resistance." The Death Adder has a similar spine at the extremity of its tail.

The tongue is long, slender and forked. It can be protruded and retracted at will. When protruded it is in constant vibration, and probably serves as an organ of touch. When retracted the greater part is gathered into a sheath at the base. The *Varanidae*, or Monitors, alone amongst the Lizards possess a similar organ.

Green Tree Snake. *Krefft.*

The *Eye* is not protected with movable eyelids, and hence the strong, irresponsive stare for which the snake is proverbial. It cannot wink or blink, or express any emotion. The soft and moist eyeball is, however, protected by a part of the skin which forms a transparent film over it, and which is shed with the rest of the skin in the slough. The *Ear* is by no means wanting, and the sense of hearing is apparently acute. The ear is always, however, hidden under a scale, and cannot be detected from the outside.

The *Teeth* are long, conical and curved. They are borne below on the lower jaw and above on the maxillæ proper, the palatine and other bones of the roof of the mouth. They are employed only to seize and to hold the prey. The front tooth in each maxilla is grooved in the Australian poisonous snakes, and connected by a duct with a poison gland which lies under and behind the eye. Whether the snake is poisonous or not, the method of biting is much the same, and somewhat complicated. A long bone, the *quadrate*, intervenes between the back of the rather small skull and the back of the lower jaw. When the mouth is shut the quadrate is inclined downwards and backwards, thus pushing the angle between the arches of the gape well behind the skull. A chain of jointed bones stretches from the point of union of the quadrate and the lower jaw to the maxilla. When the mouth is shut these bones lie in a straight line and the teeth are directed backwards. When the mouth is opened for the purpose of biting, the lower end of the quadrate is brought forward, and pushes the line of bones into an arch, so that all the upper teeth are now directed downwards or even a little forward, and are in a position to strike and hold the prey. In the case of the venomous snakes, as soon as the large fangs enter the body of the animal struck, the poison is forced by the muscle which extends over the poison gland through the puncture, and so introduced into the circulation of the victim.

Some of the poisonous snakes, as the Copper-head, when they have caught and bitten an animal, will commence swallowing it at once, while yet alive, but the Tiger Snake does not touch its prey after it has bitten it until life is quite extinct. The prey is always swallowed whole, and head first, the snakes seeming to use the tongue as a feeler to help them to discover where the head is. (There is a copious flow of mucus). The jaws are moved alternately, first one side and then the other. During deglutition, the glottis is sometimes seen to protrude a quarter of an inch from the mouth, so the animal can breathe freely during the sometimes very long operation. If the prey is of large size compared with the snake, a wonderful extension of the gape takes place. All the bones of the roof of the mouth, the quadrate, and the two halves of the lower jaw are most loosely articulated by elastic ligaments and muscles, and may be widely separated from each other while the prey is being drawn through the gape. Further down as there is no sternum clasping the ribs below, these are forced widely apart, and the skin is distended showing spaces between the adjacent scales. In this way a Tiger Snake swallows a rabbit, and the great Pythons of the tropics will swallow a calf. In captivity, and at times also in nature, two snakes will occasionally seize upon the same prey, and, as neither will give way, one will swallow the other. The actual food of the snakes in the bush consists mainly of lizards and frogs. On opening up a snake it is not unusual to find a procession of lizards, from the one just swallowed to the one in a late stage of digestion. In captivity the Tigers and Death Adders prefer mice and rats for their pabulum. The Tree Snakes feed on young or incautious or disabled birds and on the eggs, and on the tree geckoes. The Pythons will devour small Wallabies, Rat Kangaroos, Bandicoots, and Opossums, hunting on the ground or in the trees. Mr. Waite states that the Flying Foxes, as they hang in clusters from the trees, are not infrequently caught by these large reptiles. Fishes and marine animals of various kinds supply the wants of the Sea Snakes.

The *Slough*.—The skin of the snake is thrown into regular folds or pleats, and the horny scales are imbedded in the exposed portions. Since the growth of the skin does not keep pace with that of the body, the skin is cast or sloughed at intervals, a new skin having formed underneath. Some Black Snakes, which were born in captivity in the Melbourne Zoological Gardens, actually changed their skin the day after birth. Others which had been taken out of the mother after her death were active and lively, and changed their skins about a fortnight after. Generally snakes change their skin about every four months. They shed the old skin by first pushing their heads against any projecting object to loosen the skin from lips and head, then by still pushing and using the ribs, ease it off until the tail is reached. The skin of the tail is usually slipped off, and is not found reversed in the slough, all the rest being turned inside out. When the snake is healthy the shed skin is perfect. As the integument is continuous over the eyes there is a period of dullness of vision, while the old and the new skin both cover the eye, and the transparent membrane of the slough becomes opaque. During the sloughing the snake becomes sluggish, and declines all food, but is correspondingly hungry and vigorous when the process is completed. Many of the lizards similarly shed their skins.

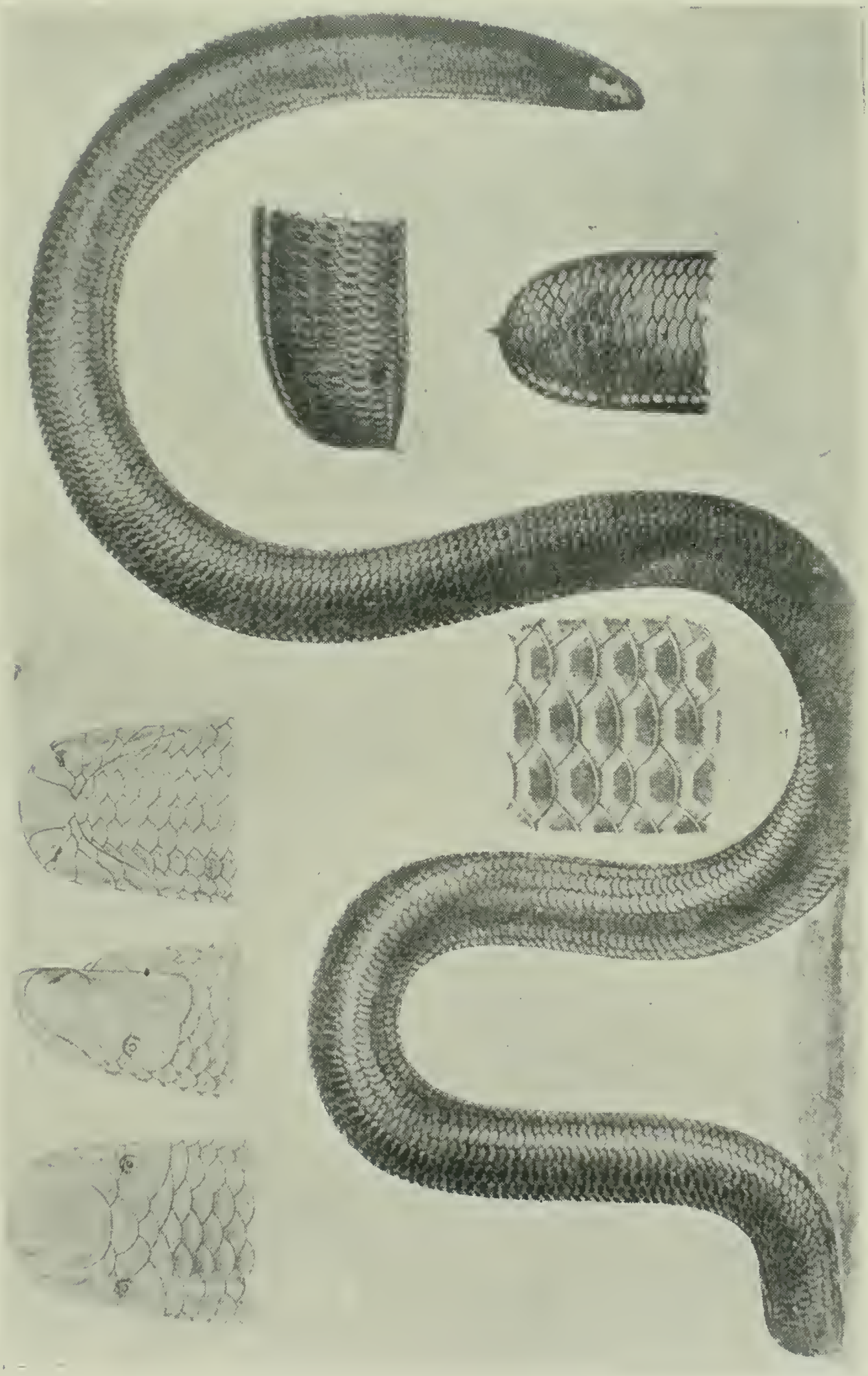
Our snakes, at least, do not charm or fascinate their prey in any way, but approach the object of their attack so imperceptibly as not to create any alarm. In the Melbourne Gardens venomous snakes have been seen to approach within half an inch of a sparrow without frightening it, and the only object the bird seemed to take any notice of was the reptile's tongue, the quivering motion of which seemed to arouse its curiosity, but certainly not its fear. Both rabbits and mice run to and fro over the snakes without showing any signs of fear, and the latter occasionally make the snakes move out of their way by nibbling at them. Birds, again, if the snake remains quiet for a short time, will frequently perch upon its back and prune their feathers, and even try to remain on after the snake has commenced to move.

Snakes will only feed in warm weather, and if it becomes cold or dull during summer, they refuse to eat until the sun resumes its sway. During the winter they hibernate, the smaller under stones usually on the higher ground, under logs, or in hollow ones, and the larger in holes made in the ground by other animals, for they do not themselves excavate burrows. The teeth are shed, new ones being rapidly produced. In the poisonous snakes there are always a number of immature fangs behind the two in use, and if these are destroyed by any accident, another pair will be fully developed and ready for use within the week. The point of the fang is extremely fine and solid, the tooth being grooved in its lower three-fourths. The poison channel is enamelled. In the Australian venomous snakes the fangs are permanently erect, and, when the mouth is closed, fit into a depression in the lower jaw. Since the fangs project beyond the immature teeth behind them, the wound produced by the bite of a venomous snake shows only the two punctures a certain distance apart, while the wound produced by the non-venomous kinds shows two curved lines of punctures, each tooth of the maxilla leaving its mark.

There is unfortunately no ready method of determining whether a snake is venomous or harmless if met with moving quickly in the bush, unless you are previously well acquainted with the appearance and the quality of the particular snake. The only harmless snakes commonly met with are the large Carpet and Diamond, and the Green and Brown Tree Snakes. The others had at least better be held under suspicion. The small and slim snakes, some of which are locally known as Whip Snakes, are not seriously dangerous. There are five species which are widely distributed and fairly common, which are really deadly. The fair bite of a vigorous full-grown individual of any one of these on the naked skin will be almost certainly fatal to the strongest man in the best of health. These are the Death Adder, the Tiger Snake, the Black Snake, the Brown Snake, and the Copperhead or Superb Snake. Others, which are equally deadly, are fortunately very rarely seen or encountered. All the Sea Snakes are highly venomous, but as the gape is small, they have a difficulty in biting a large object.

The nature of the poison, more particularly of the Black Snake, has been investigated by Professor C. J. Martin and Mr. J. M. Smith. By an ingenious device they succeeded in collecting the venom free from mucus and saliva. They separated the constituents, and by careful experiment determined that the toxic properties were restricted to the proteids present, and finally to two albumoses soluble in water and in dilute salt solution. They found that the virulence of the poison was considerably greater than that of the cobra. Thus 1/1000th grain of the dried poison, dissolved in 1% salt solution, when injected into a vein, invariably kills a rabbit of five pounds weight in about a hundred seconds. Fortunately the quantity voided at one time by the Black Snake is insignificant when compared with that obtained from an average Cobra or Rattlesnake, which latter discharges at a single bite five to ten times as much venom as the experimenters were able to procure at any one time, under the most favourable circumstances, from a Black Snake six feet in length.

Death from snake-bite is rare in Australia. There is no alarming mortality from this cause such as there is in India. Not because the snakes are not deadly. As we have just seen, the virulence of the poison itself is actually much greater than that of Cobra venom. But there are several mitigating circumstances. The snakes are, as a rule, more anxious to avoid man than he is to avoid the snakes. You may traverse miles of virgin bush in what seems to be good snake country without seeing one of them. With the exception of the Death Adder, they quickly withdraw when they hear your step on the ground or the crackling of the dead sticks as you pass along. It is only in January or February when they are mating that the snakes lie about, and are too preoccupied to make off at your approach. In the more populous parts of the continent the snakes are only in evidence during the summer months; in the winter they are hibernating in retreat. The quantity of venomous fluid ejected by our snakes is nothing like the quantity ejected by the Cobra or Rattle-snake. The proportion of the toxic principles present in the fluid, too, was found by the experimenters quoted to vary very greatly, doubtless depending on the condition of the snake, its age and vigour. The poison-glands may be exhausted by previous bites. In cold weather the reptiles are nearly dormant; while changing the skin they are sluggish. Another fact elicited by the experimenters was that injection into a vein was at least ten times as deadly as mere subcutaneous injection. The fangs of our largest venomous snakes are not nearly so long as are those of the Rattle-snake and Cobra, and consequently do not penetrate so deeply, and have less chance of perforating a vein. The points are solid for a quarter of the length of the fang, and consequently the poison is not conducted to the depth of the full length of the fang. An ordinary sock or the cloth of the trousers is usually quite sufficient protection; the two marks are seen on



McCoy Prod. Z.V.

Blind Snake. Typhlops nigrescens.

the skin but the poison has been ejected on to the garment. It is a bite on the bare skin which is dangerous.

Lastly, the Governments of the various States issue full instructions for the immediate treatment of snake-bite, and disseminate these widely, and especially in all the State schools, so that it is generally understood what ought to be done in case of the accident. Professor Martin and Mr. Smith, in their paper, showed that when the poison is mixed with twice its weight of caustic soda dissolved in a few drops of distilled water, and then injected subcutaneously, a fatal dose fails to produce any effect. The injection of ammonia then, as suggested by Professor Halford, seems to be a reasonable method of treatment, and as a stimulant the ammonia is further useful in cases of collapse. "The chopping off of a finger, a by no means uncommon bush remedy, may be productive of more harm than the disease sought to be cured," writes Mr. Waite, "and I know of one man who can exhibit a bottle containing one of his fingers, and the snake which bit it, a perfectly harmless reptile." But, excepting antivivine, permanganate of potash is at present the most effective antidote, and hypodermic syringes with a certain amount of this easily procured commodity should be a portion of the outfit of every camping-out party.

In regard to *Reproduction*, Mr. Waite writes: "As befits their peculiar, lengthened body, nearly all the internal organs are elongated: this applies also to the eggs, those produced by some species being three times as long as broad. Eggs are produced by most of our harmless snakes, namely: the Blind Snakes, the Fresh-Water Snake, Tree Snakes, both Green and Brown, and the Pythons, which latter are specially interesting from the fact that they incubate their eggs, thirty or so in number, and are the only snakes known to do so. The members of the genus *Diemenia*, including the deadly Brown Snake, also produce eggs, a habit common to some, perhaps all, species of the genera *Rhynchelaps* and *Pseudelaps*. With these known exceptions, the venomous snakes (the Water Snakes and Sea Snakes included) produce their young alive, sometimes in great numbers. Thus the Tiger and Superb Snakes produce each thirty or more; half of this number appears to be the complement of the Death Adder; while I have not known more than ten to the Blackbacked Snake. The Black Snake and the Black-bellied Snake each bring forth twenty young ones." Mr. F. H. Reid states that in Tasmania he has counted as many as forty-eight and fifty-two young ones in different female Tiger Snakes. In the *Victorian Naturalist* it is stated that Mr. Alexander Morton, of the Hobart Museum, found on one occasion no fewer than 109 living young ones, also in a Tiger Snake. It may be that in the colder climates this snake is more prolific. With regard to the incubation, it is doubtful if the warmth of the animal assists in the operation, for the temperature of the snake even when breeding is not much above that of the atmosphere around it. The Carpet and Diamond Snakes lay their eggs in a damp shady spot, and generally coil themselves over them. The object is in part, if not mainly, to keep the eggs at a certain degree of moisture, for if the eggs get too dry they shrivel, and do not hatch. The same care is shown by some of the lizards, and the presence of moisture is secured in the case of the eggs of the Tortoises and Turtles, the egg of the latter being buried in *wet* sand.

The young snakes can look after themselves as soon as they see the light, but generally for a few days remain in or about the hole or hollow log in which they have been born, sometimes in company with the parent, sometimes not. They may be seen occasionally basking in the sun with their parent, and in time of danger immediately hide themselves to the best of their ability. No reptile knows better how to take cover than a snake. If you take your eyes off an adult snake to pick up a stick it is very difficult indeed to find it again. In the case of the young ones a few inches long the difficulty is much increased. It has often been said that the young will take refuge in the gullet of the mother, but this is not well substantiated.

Snakes are kept in check by a number of other animals, which serve as their enemies. Amongst birds may be mentioned the Eagle and the various Falcons, Hawks, and Owls, the Butcher birds (*Craticus*) and Sooty Crow-Shrikes (*Strepera fuliginosa*), and above all the Laughing Jackass. Swooping down from his perch of observation, with his formidable beak the latter strikes the snake before his own feet reach the ground, breaks the back of the reptile, and so disables it. He will fly up with the snake in his mouth, and then let it drop from a height back to the ground, and repeat this treatment until the snake can be safely swallowed. A clergyman, who was also a naturalist, was in the middle of his sermon in a bush church, when, glancing out of a window, he observed a Great Kingfisher engaged in these operations. The naturalist struggled with the clergyman, but both were satisfied; the interesting incident was carefully observed, and the tenor of the discourse happily maintained. Afterwards the congregation had a lesson in Nature-study. The large Monitors destroy the smaller kinds of snakes. The Native Cat will also attack them. In addition to man himself, who is usually an enthusiastic snake-killer, the domestic cat, and especially the domestic pig, destroy numbers. The reserve about the lighthouse at Wilson's Promontory was infested by snakes, but they soon disappeared when pigs were introduced, these animals hunting and devouring the reptiles. The wild pigs, which are numerous in parts of Australia, probably consume many snakes.

Key to the Families.

A. Burrowing blind snakes.	Typhlopidæ.
B. Active snakes with well developed eyes:	
Coronoid bone present in the skull; præfrontal in contact with the nasal. Vestiges of hind limbs. Harmless snakes, mostly arboreal. The Pythons.	Boidæ.
Coronoid bone absent; præfrontal not in contact with the nasal. No trace of hind limbs. Harmless or venomous. Ground, tree or water snakes.	Colubrinæ.

Family Typhlopidae.

The snakes of this family are highly specialized for an underground life. They are mostly small, a foot or less in length, and remarkably rounded in the body, so that they are easily mistaken for worms by the uninitiated. The head and the tail are both short, and not distinctly marked off from the body: the two ends of the animal are indeed much alike. The head can be distinguished as being smaller, and bearing large symmetrical plates; the tail is bluntly rounded and is bent downwards at the end, so that the terminal thorn appears on the ventral surface. One of the large plates of the head covers the very rudimentary eye, which appears like a faint blue spot, or in some species is not visible at all. There are no external limbs, though traces of the hind pair can be detected under the skin. The scales of the body are in some 22 rows, and are highly polished and glossy, in order to offer little resistance to the advance of the animal through the soil. The scales of the belly are similar to those on the back and sides. The thorn of the tail enables the snake to obtain a hold on the soil, and so to push itself along from a fixed point; and the fore part of the body is somewhat narrower than the hind part, by which contour the snake is better able to insinuate itself through the sand or loose soil. The mouth is small, and situated on the under surface of the head; there are no teeth in the lower jaw, while the few which are present in the upper jaw are small and not perforated or grooved. The Blind Snakes feed chiefly upon ants and their eggs, which they obtain by the use of the long forked tongue. They are, therefore, useful animals, and in no possible way harmful. The mouth is so small, the teeth are so tiny, and there is no poison gland, so that it would be very difficult for one to bite a man, and if it did bite, the bite would scarcely be felt. Mr. Waite estimates the number of species, of the single genus *Typhlops,* as nineteen. They are all similarly coloured, more or less grey above, some darker, some lighter, and flesh-coloured with yellow or white below. The largest species is *T. polygrammicus,* 28 inches, which, Mr. Waite says, appears to be the commonest species in New South Wales, while *T. australis* is most abundant in South Australia and *T. bituberculatus* in Queensland.

Professor McCoy says of one of the Victorian species: "It is not uncommon in the northern warmer parts of the colony in localities having a loose, friable, or sandy soil, in which it burrows to a considerable depth with extraordinary ease and quickness. Two large ones sent to me alive I have kept alive for some time in large glass jars half filled with sandy soil at bottom, into which, when brought to the surface, they burrow so rapidly that the whole body is out of sight in an instant—the head being first raised, then arched, and forced down with such strength that the glossy smooth body is quickly buried to the greatest depth. These specimens were dug out of an ant-hill in which they dwelt in the midst of the abundant insect food suited to them. It is almost impossible to hold them, they struggle with such strength, and are so smooth and slippery. The tongue is very long, narrow, flat, largely forked at the end, and of a dull red colour, being darted out frequently to a length of an inch or so, as in ordinary snakes."

Family Boidae.

This family includes the seven or eight Pythons of the continent. They are all large snakes, some of the northern species attaining a length of at least sixteen feet. The head is flat, and the body thick and muscular, and covered by scales in a far greater number of rows than in any of the other snakes. The pupil is vertical, but dilates at night, for the Pythons are properly night-loving, and when seen moving about in the day-time it is because they have been disturbed while resting. The teeth are numerous, and all solid; hence the bite is not poisonous, but is not to be invited, as the animal can take a very firm hold with the recurved teeth, and a limb once held is difficult to withdraw. They are more truly arboreal, though Krefft calls them Rock Snakes. Coiled on the branch of a tree, the snake having judged its aim, darts forward with open jaws, fastens upon the victim, takes a couple of coils round it, and by the tremendous pressure of the muscles crushes it to death. When the prey is dead the snake works its coils round and round, tightly squeezing it all the time, practically breaking all its bones, and elongating it ready for swallowing, which it does head first. Possessing this power, the larger Pythons must be approached with great caution. One of our best known naturalists, who is fearless in the handling of all snakes, on one occasion attempted single-handed to capture a Python some ten feet long, but the reptile coiled around him, and it was only the timely arrival of a comrade with a tomahawk which saved his life. The Pythons are long-lived, living in captivity for many years. The males, it would seem, are smaller than the females. They are egg-layers, and the only snakes which are known to take care of the eggs after they are laid. Dr. Günther records that a female Python (not an Australian species) produced fifteen eggs in May in England, and that having collected them in a conical heap, she entirely covered them by coiling herself round them spirally till her head rested on the centre on the top of the cone. In this position she remained till the 3rd of July, when eight of the eggs were hatched. Dr. Günther observed an increase of temperature between the coils of the snake. Similar heaps of eggs of the Carpet or Diamond Snake, neatly piled up in a nest of dry grass, have been found in hollow logs. It seems most likely, however, as we have said, that the main object of the Australian Pythons is to keep the eggs sufficiently moist, not altogether an easy matter in our dry and sunny climate. In the Pythons two small spurs appear externally, one on each side of the vent. These are the only vestiges of the hind limbs found in any snakes.

Key to the Genera.

1. Præmaxillary bone with teeth.
    Tail not prehensile. Head with large symmetrical shields as far as the eyes. Rostral shield not pitted. Liasis.
    Tail prehensile. Head with small scales. Rostral shield pitted. Python.
2. Præmaxillary bone without teeth. Head with large shields reaching behind the eyes. Aspidites.

Genus Liasis.

This includes the largest of our Pythons, ranging from 14 to 16 feet. They are all confined to the Northern and Central parts of the continent, being tropical snakes. There are three species. The sub-caudal scales are in two rows.

L. childreni. S 41—45, V 257—287, A 1, SC 38—53.
Brown above, with distinct large darker spots arranged in five or six longitudinal series, below uniform yellowish. Length 14 feet.

L. fuscus. S 47—49, V 275—291, A 1, SC 65—72.
Uniform brown above, yellowish beneath. Length 14½ feet.

L. olivaceus. S 69—75, V 349—361, A 1, SC 100—102.
Uniform olive-brown above, yellowish beneath. Length 16 feet.

Genus Python.

Head covered with small scales; frontal plates, distinct in three pairs; rostral shield with a pit on each side; gape sinuous, several of the labials pitted; sub-caudals in two rows.

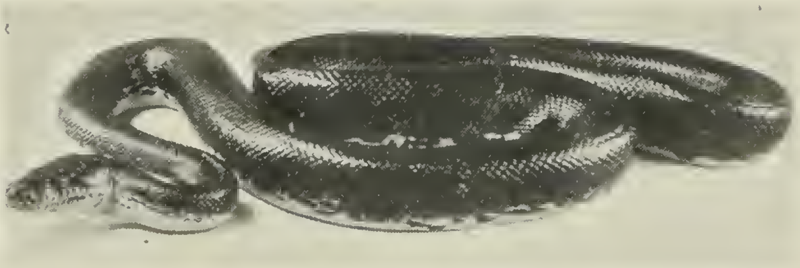
The Carpet Snake.

Python variegatus.

S 49—51, V 251—304, A 1 or 2, SC 63—92.

The Carpet Snake reaches a length of 14 feet, but the southern forms are much shorter. The ground colour above is pale brown with a tinge of greenish grey, and carries an irregular pattern of dark markings, which has given the snake its name. The back is often marked out into three or four rows of dark blotches, and there are dark streaks about the head. The under side is yellow, barred and spotted with black. It extends all over Australia except southern Victoria, but is not found in Tasmania. It feeds on the smaller mammals, especially the opossums, and on birds, including poultry when available. Like the American Boa, the Carpet Snake can hang by the short prehensile tail coiled round a branch, with the two little leg-like spurs acting in opposition to effect a firm hold.

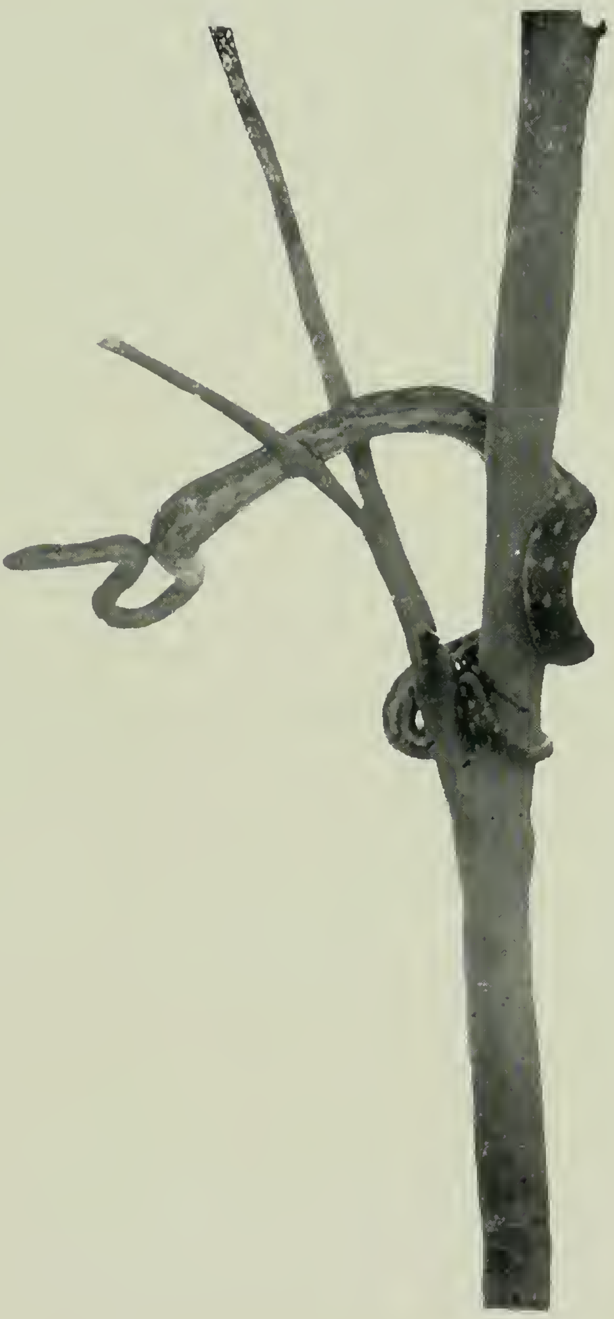
Carpet Snake. *Austr. Mus.*



Diamond Snake. *Austr. Mus.*

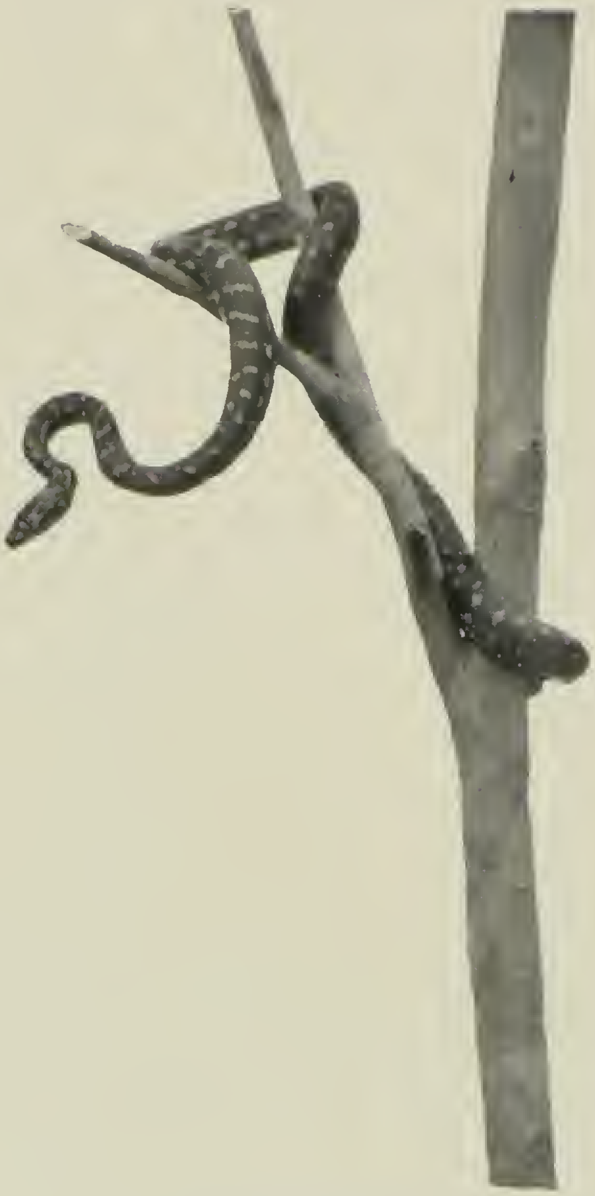
The Diamond Snake, *Python variegatus*, var. *spilotes,* is a variety of the Carpet found only in a restricted area on the

East Coast. It attains a length of eight feet. It differs only in the colouring of the upper surface. Normally the Diamond Snake is black, with a yellow spot in the centre of each scale,



Young Diamond Snake. *From life.*

and with diamond-shaped clusters at fairly regular intervals. Occasionally individuals are obtained which are coloured partly like the Carpet and partly like the Diamond. Those commonly brought into Sydney are small and slender, but Mr. H. Selkirk obtained two in the Kurrajong, one 8 feet 6 inches, and the other 9 feet long, the former containing a Ring-tailed and the latter a Common Opossum.

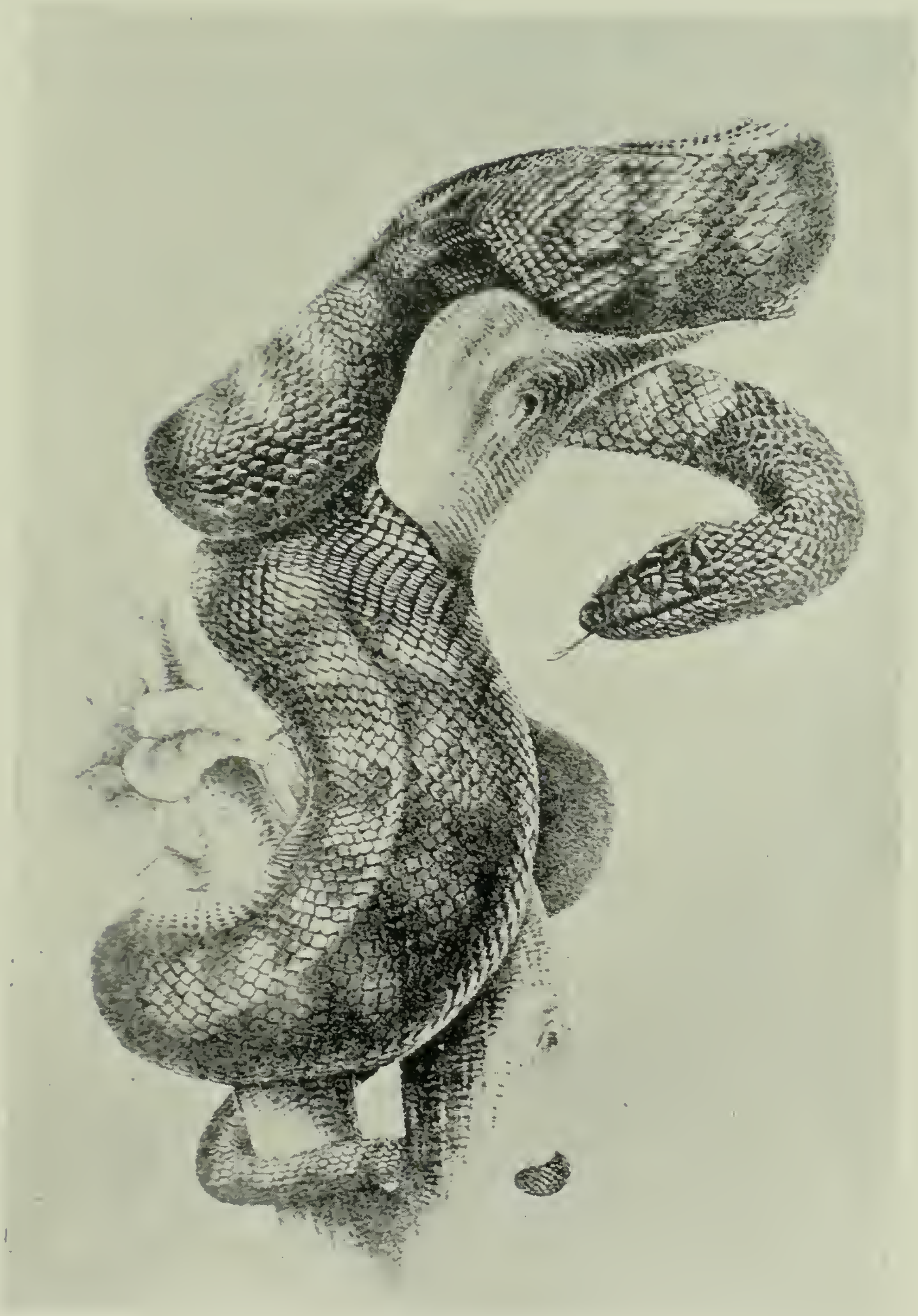


From life.

Young Diamond Snake.

P. amethystinus.

S 39—53, V 289—328, A 1, SC 85—117. Yellowish or purplish-brown above, uniform or with darker and lighter markings; below uniform yellowish. Length 11 feet. From the Moluccas to North Queensland.



Black-headed Python. *Krefft.*

Genus Aspidites.

Body thick and compressed. Crown covered with broad shields reaching behind the eyes; labial shields without pits; sub-caudals entire, except the last ten or twelve, which are divided. Tail conical, prehensile, ending in a blunt point.

The Black-headed Python.

A. melanocephalus.

S 49—55, V 321—350, A 1, SC 60—64. Light brown above, with darker cross bars; yellowish beneath. Head and neck jet black above and below. Length 8 feet. North Australia.

Ramsay's Python.

A. ramsayi.

S 59—63, V 293—299, A 1 or 2 SC 53. Length 6 feet. Known only from the district around Bourke.

Family Colubrinae.

The Colubrine Snakes are arranged in three sections.

- *Aglypha*, in which all the teeth are solid. These are quite harmless.
- *Opisthoglypha*, in which some of the hinder fangs are grooved. Some are venomous and others harmless.
- *Proteroglypha*, in which the front teeth of the upper jaw are grooved, the grooves serving to conduct the poison. All are venomous.

Section Aglypha.

Genus Tropinotus.

Eye with round pupil. Teeth of the lower jaw sub-equal. Scales in our species strongly keeled, the ventrals rounded. Sub-caudals in two rows. Nostril on the side of the head.

The Fresh-water Snake.

Tropidonotus picturatus.

S 15—17, V 128—165, A 2, SC 52—82. Grey or rich brown above with salmon-tinted abdominal plates, generally with red spots on the sides. Length 3 feet. East Australia, north of the Clarence River.

Seen in large numbers, at dusk, in and about the lagoons or water-holes. The Ringed Snake of Britain belongs to the same genus, and has much the same habits. They are good swimmers, but not completely aquatic like the Sea Snakes. Oviparous.

Genus Stegnotus.

Eye with vertical elliptical pupil. Front teeth of the lower jaw enlarged. Scales smooth, the ventrals with obtuse angles. Sub-caudals in two rows.

The Hooded Snake.

S. cucullatus.

S 17, V 196—207, A 1, SC 73—90. Length 3ft. 7in. Cape York.

The Leaden Snake.

S. plumbeus.

S 17, V 219 A 1, SC 74. Uniform shining leaden-black above, pure yellowish white below. Length 4 feet. Herbert River, Queensland.

Genus Dendrophis.

There are two kinds of Australian Green Tree Snakes. They are both green in colour, and so escape observation when gliding among the foliage of the trees on which they live. They are slender, and extremely graceful and active in their movements. The brighter and hotter the day, the more active are the snakes. There is a notch on each side of each ventral scale; and the line of notches furnishes a rough keel on each side of the body which greatly assists the snake in its meanderings. The Green Tree Snakes feed on whatever small fry their habitat may provide, tree-frogs, geckoes, and small birds. They are seldom seen on the ground. They are oviparous.

The Northern Green Tree Snake, *D. calligaster.* S 13, V 176—211, A 2, SC 125—151. Greenish-brown above, sides of head and neck yellow, belly purplish yellow, powdered with purplish-brown. Length, 4 feet. Cape York.

The Common Green Tree Snake, *D. punctulatus.* S 13, V 191—220, A 2, SC 120—144. Olive-green above and yellow below, the shade of green varying to suit the foliage. When angry, this Snake expands its body vertically, while all the poisonous snakes, on the other hand, flatten their necks horizontally. Length to 7 feet, usually 5 or 6. All over Australia except southern Victoria, not found in Tasmania.

Section Opisthoglypha.

To this section belong four species of true Fresh-water Snakes and the nocturnal Brown Tree Snake. The Water Snakes are found only in the far North of Tropical Australia, and are thoroughly aquatic. "In their organisation they approach the marine snakes, and are easily recognizable by the position of the nostrils on top of the snout, which enables them to breathe by raising a small part of the head out of water. The same arrangement is common to crocodiles, sea-snakes, and some aquatic mammals. Many have a distinct prehensile tail, by means of which they hold on to projecting objects. Their food consists mainly of fish. All of them appear to be oviparous, and perform the act of parturition in the water. They do not grow to any considerable size, are of gentle disposition, and their bite is by no means dangerous. They do not feed in captivity, and therefore die after a short time." (Krefft.)

Austr. Mus.

Brown Tree Snake.

The four species belong to four genera, and may be recognised as follows:—

1. Nasal scales in contact:	
Scales smooth.	Hypsirhina.
Macleay's Water Snake.	H. macleayi 2 ft. 3in.
Scales keeled.	Cerberus.
The Australian Rockadam.	C. australis 2 ft.
2. Nasal scales separated by an internasal.	
Loreal present, scales keeled.	Myron.
Richardson's Water Snake.	M. richardsoni 1 ft. 6 in.
Loreal absent, scales smooth.	Fordonia.
The White-bellied Water Snake.	F. leucobalia 3 ft.

The Brown Tree Snake.

Dipsadomorphus fuscus.

S 19—21, V 236—257, A 1, SC 87—103. The Brown Tree Snake is slender in form, with a flat triangular head, broad behind and very distinct from the neck. The extreme length is 7 feet. It is reddish-brown above, with many oblique, black or dark-brown cross-bands. The belly is salmon-coloured or yellowish. It is decidedly arboreal, and as it hunts by night, it is seldom seen, its colour agreeing with that of the bark. It feeds on birds, which it catches while they are asleep, and on lizards and frogs. Its allies are mostly Indian Snakes, and are said to live on birds and mammals only. Like the Green Tree Snake it is oviparous, and, like it too, is harmless to man.

Section Proteroglypha.

All are poisonous, but the smaller ones are not dangerous to man. The larger are deadly. They are divided into the *Elapinae*, which include all our dangerous land snakes, and the *Hydrophinae*, which include the Sea Snakes which are met with off our coasts. In the former the nostril is at the side of the snout, the body is rounded, and the tail conical and tapering; in the latter, the nostril is on the top of the head, the body is more or less compressed, and the tail is strongly compressed into a vertical paddle.

Division Elapinae.

Fifty-seven kinds of snakes of this division are found in Australia. Lack of space will not allow us to characterise them all. This is of less consequence, as some of them are very rare, and in some cases only known from single specimens. We shall, therefore, only describe the snakes which are more widely distributed, and so are likely to be met with.

Genus Pseudelaps.

Head more or less distinct from the neck. The maxillary bone carrying a poison fang, followed by 7 to 15 small grooved teeth. Snout rounded. Eye small with vertical pupil. Tail rather short, the sub-caudal scales in two rows. Oviparous.

The Red-bellied Snake.

Pseudelaps squamulosus.

S 15, V 170—183, A 2, SC 34—52. A small, nocturnal, but very handsome little snake. It is purplish-brown above, and bright red beneath in adult specimens, the ventral plates clouded with purplish-brown; the division line of the two rows of subcaudals marked in the same way. The head has a purplish-brown cap, bordered by bright orange bands. Length 20 to 30 inches. It frequents rocky desolate places, and is not common. Like most of the small snakes it is most often found under flat stones in the winter season. New South Wales and Queensland.

The Red-naped Snake.

Pseudelaps diadema.

S 15, V 170—255, A 2, SC 69—105. Another very beautifully-coloured little snake. It is brown above, each scale with a yellow spot in the centre; the head and the neck are black, separated by a bright scarlet spot or collar on the nape; the under-parts cream-coloured. It is 1 to 2 feet in length. Distributed over all Australia north of the Murray River, and one of the commonest Snakes in New South Wales. It is quite inoffensive, allowing itself to be freely handled.

Whip Snake.—Diemenia psammophis.

Genus Diemenia.

Head more or less distinct from the neck. The maxillary bone carrying a poison fang followed by 7 to 15 small grooved teeth. Snout angular. Eye rather large with round pupil. Tail rather long, the sub-caudal scales in two rows. Oviparous.

The Grey Whip Snake.

Diemenia psammophis.

S 15, V 170—255, A 2, SC 69—105. An elegant slender Snake, met with in all parts of Australia to the north of the Murray. It is common on the sandstone country around Sydney, moving with great ease over the rocks and amongst the bushes. As in so many of the Snakes, the colour is very variable. It is grey, olive, or brownish above, and greenish or grey underneath. The end of the tail is orange or salmon-coloured. A very constant mark is a yellow spot around the eye, produced backwards in a short line of the same colour. It feeds on insects and small frogs and lizards, and its bite causes no more irritation than the sting of a bee (Krefft). The length is from 2 to 4 feet. From 15 to 20 eggs are deposited by it once a year, under stones exposed to the sun, generally in the beginning of December. During the cold season it retires under flat stones on more exposed ground with a northern aspect, and does not go into the ground. Sometimes five or more have been found under the same stone.

From life. Brown Snake. *C. Frost.*

The Brown Snake.

Diemenia textilis.

S 17, V 190—232, A 2, SC 46—73 pairs. This is very widely distributed all over Australia, and is one of the deadly kinds to be avoided or destroyed. The young, when hatched out of the eggs, are very pale brown in colour, and often prettily marked with many black rings, from the head to the tail. These rings usually quite disappear in the full-grown snake, which is brown above, and dirty white beneath, the ventral scales clouded on the sides with purplish grey. Some of the western Snakes are very dark, almost black, when adult. The Brown Snake reaches a length of 6 feet, hunts by day, and is not very particular in its choice of locality. It deposits its eggs to the number of 20 or thereabouts, among dead leaves or other débris.

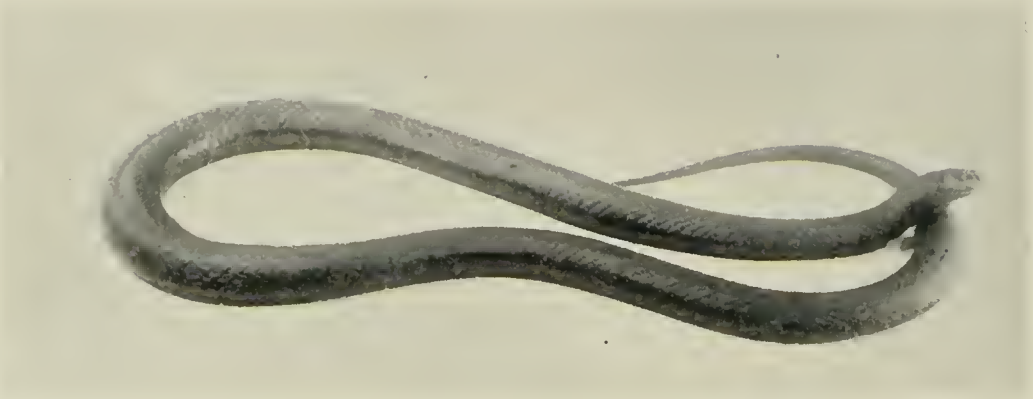
Genus Pseudechis.

Head more or less distinct from the neck. The maxillary bone carrying a poison fang, followed by 1 to 5 small teeth, which may be indistinctly grooved. Scales smooth, directed backwards. Ventral scales rounded. Sub-caudals all or in part in two rows. Viviparous.

The Black Snake.

Pseudechis porphyriacus.

S 17, V 180—200, A 2, SC 50—60 pairs, or some undivided. The commonest of the deadly Snakes, spread over Australia except in the North, but not occurring in Tasmania. It prefers marshy places, or the neighbourhood of water, and dives and swims well. Like several of the other Snakes, it can remain under water for a considerable time, and from its habit of lying still on the bottom is dangerous to bathers. It is black on all the upper surface, and beneath of a beautiful carmine or red, each scale edged with black, the scales under the tail quite black. Its length reaches to 6 feet, but, though a few veterans have been killed which were 7 feet long, this is quite exceptional, and the Snake is quite large and dangerous enough if it reaches 5 feet. It subsists principally upon frogs, lizards, even the large Blue-tongued Lizards, and the smaller mammals. Krefft says that sixteen of the young of the Water Rat were taken out of one specimen, showing that the Snake had plundered four nests. Fifteen or twenty young ones are produced alive, appearing in March, when most of our Snakes bring forth their young. During the winter the Black Snake retires into holes in the ground. Like the Tiger Snake and the Copperhead, the Black Snake when angry flattens and distends the neck in Cobra fashion. It is a most venomous reptile, but will not attack man unless trodden upon, or cut off from means of escape. When swamps are drained, large numbers of the Snakes are often seen by the workmen.



Austr. Mus.

Black Snake.

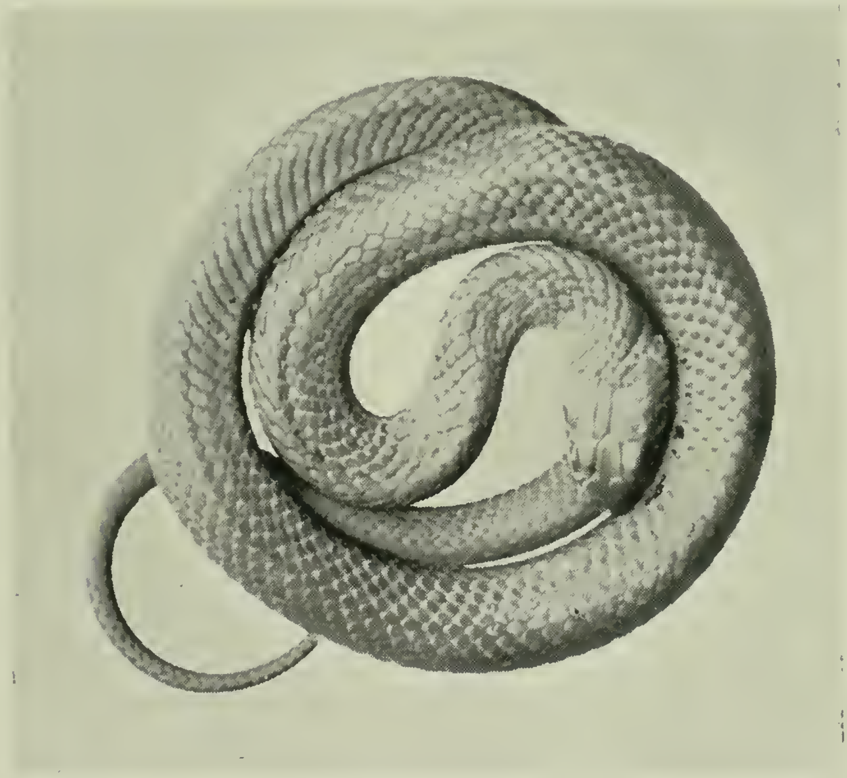
Genus Denisonia.

As in *Pseudechis,* but the sub-caudals in a single row.

The Copper-headed Snake.

Denisonia superba.

S 15—17, V 145—160, A 1, SC 41—50. This deadly Snake is a South-eastern form, abundant in Tasmania, Gippsland, and the southern mountains of New South Wales, attaining in the colder districts a length of between 5 and 6 feet. In the Blue Mountains it is rarer, and not longer than about 4 feet. It varies in the colour considerably, from black or dark brown to reddish-brown, or rarely a bright red. The head is coppery in the young, but darkens in the adult. There is usually a black patch on the nape, again more distinct in the young. The sides are often tinged with red. The belly is yellowish-olive, shading into dark grey behind. The very black individuals in which the red is conspicuous may be easily mistaken for Black Snakes, but the species are quite distinct. It frequents swamps, and feeds on lizards and frogs. It is not so aggressive, or so deadly as the Tiger Snake.



From life. Copper-headed Snake. *C. Frost.*

Several of the small Diemenias and Denisonias are called Whip Snakes in the different States. The White-Lipped Whip Snake, *Denisonia coronoides,* 18 inches, and the Little Whip

Snake, *D. flagellum*, 15 inches, are the common ones in Tasmania and southern Victoria. The former has a white band along the upper lip and the side of the neck. The latter is umber-brown, the whole of the head covered with a large black patch. The subcaudals of both are in a single row.

The Black-bellied Snake.

Denisonia signata.

S 17, V 153—170, A 2, SC 41—56. Dark olive green or brown above, bluish-black below. Rather common in New South Wales and South Queensland. Length 2ft. 6in. The female produces from 15 to 20 young. The bite is not dangerous.

The Northern Pale-headed Snake.

Denisonia pallidiceps.

S 15, V 170—178, A 1, SC 37—38. Above uniformly blackish olive, head uniformly light olive, the under surfaces yellowish. Length 2 feet. Northern Australia.

Genus Hoplocephalus.

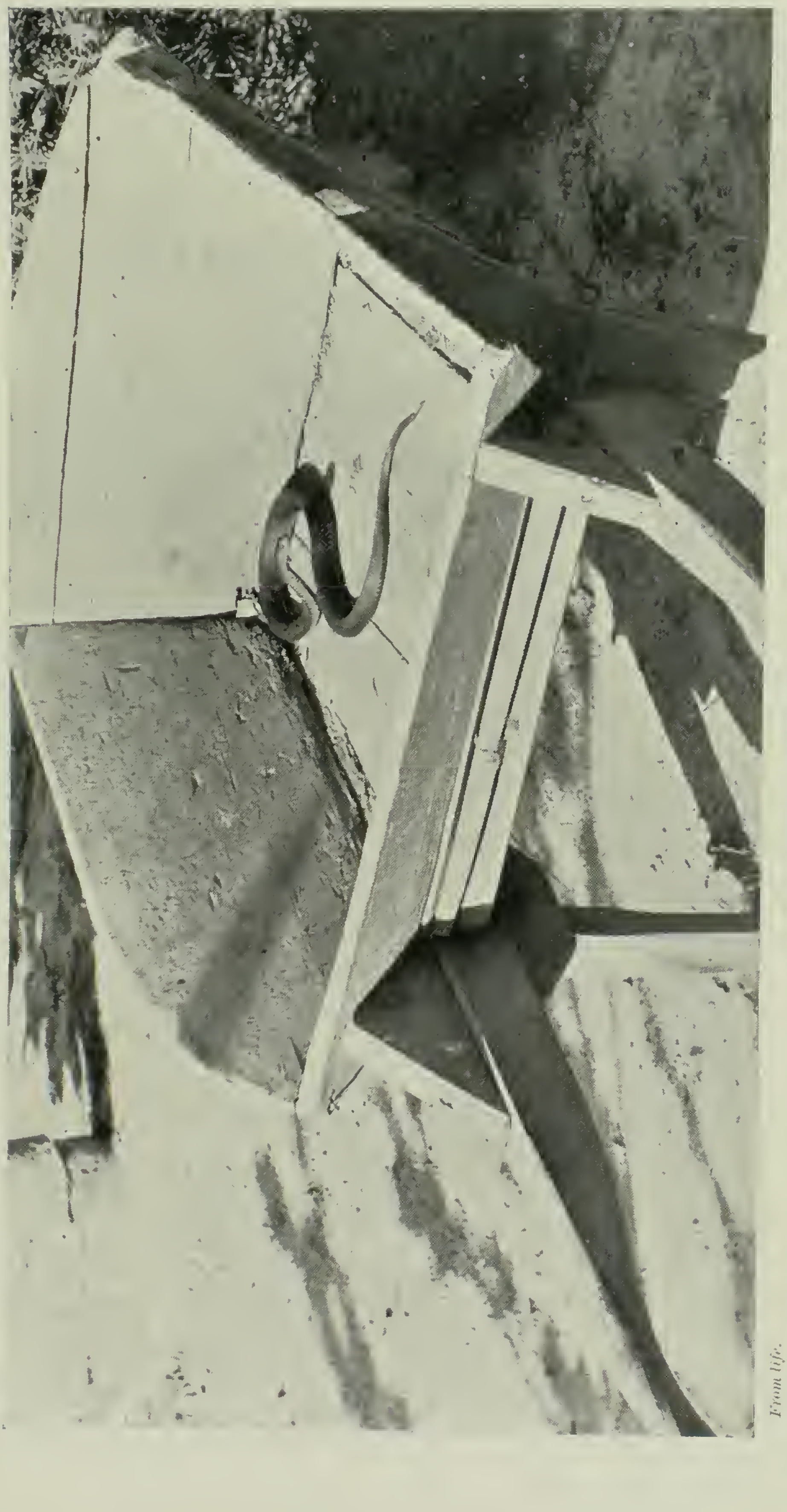
As in *Denisonia*, but the ventral scales angular, and notched on the sides.

The Broad-headed Snake.

Hoplocephalus bungaroides.

S 21, V 204—221, A 1, SC 40—56. Head flat, broad behind, very distinct from the neck. Black above, with yellow spots forming irregular cross bands; sides yellow; belly black or dark lead colour. Length to 3 or 4 feet. A nocturnal snake, formerly very common about Sydney, but not known beyond New South Wales. Lies under stones in the winter.

Experiments with goats, dogs, and Echidnas did not prove fatal, Krefft says, and adds: "If a person be bitten by one of them, the simple act of sucking the wound is sufficient to avert any unpleasant consequences, but should nothing be done, a violent headache, a certain stiffness in the spine, and some local swelling are generally the consequences. It takes from thirty minutes to an hour before these symptoms set in."



From life.

C. Frost.

Copper-headed Snake.

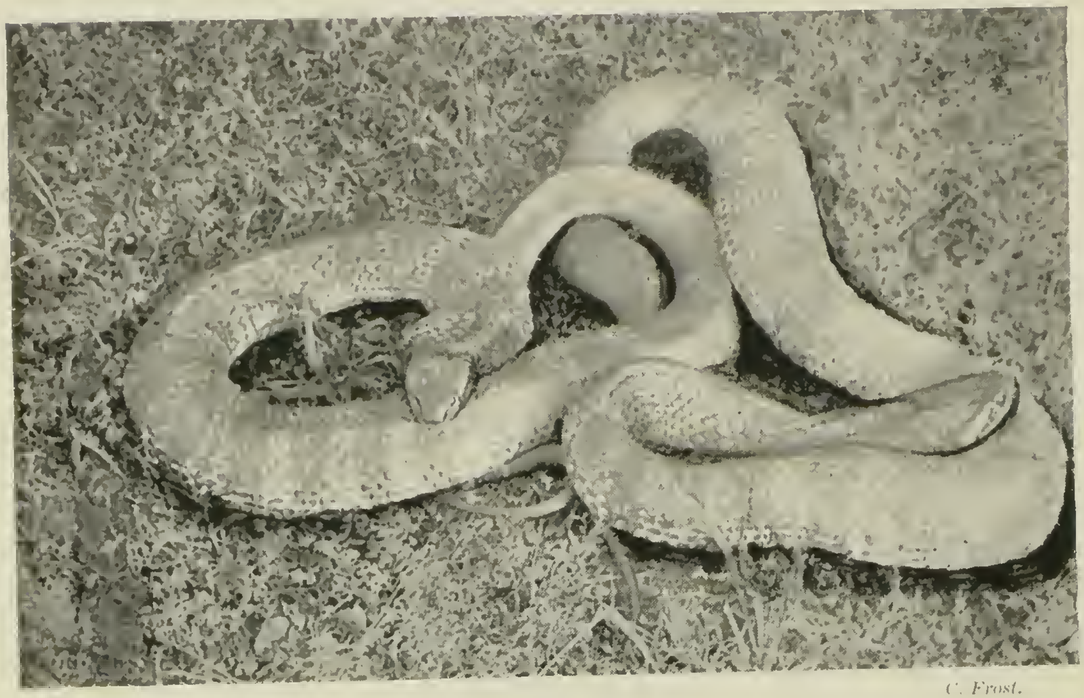
Stephens' Banded Snake.

Hoplocephalus stephensii.

S 21, V 239, A 1, SC 60. Head not so broad and distinct as in preceding. This Snake is alternately banded with black and with yellowish; below it is of a light leaden blue. Length 2ft. 6in. Confined to New South Wales.

Genus Tropidechis.

As in *Denisonia*, but the body scales are strongly keeled.



From life. *C. Frost.*

Tiger Snakes.

The Clarence River Snake.

Tropidechis carinatus.

S 23, V 165 171, A 1, SC 52—54. Head quadrangular, distinct from the neck. Brownish above, with some irregularly interrupted blackish rings; belly whitish, clouded with purple at the sides, subcaudals uniformly purple. Length 2ft. 6in. Northern New South Wales and Queensland.

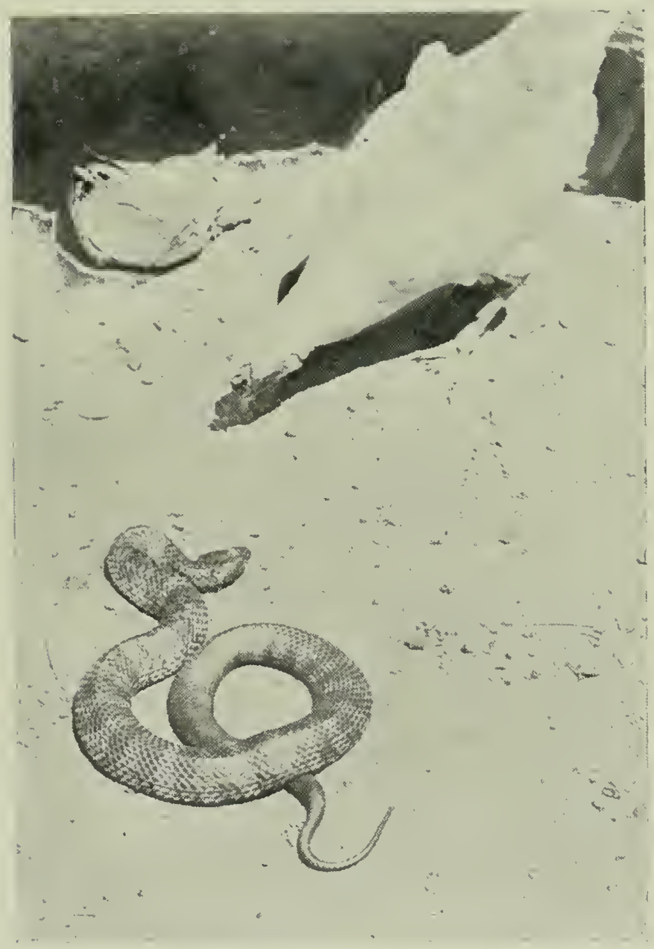
Genus Notechis.

As in *Denisonia,* but the scales of the body are directed obliquely and not directly backwards, those on the sides shorter than those on the back.

The Tiger Snake.

Notechis scutatus.

S 15—19, V 146—185, A 1, SC 39—61 in one row. The most aggressive and vicious, and one of the deadliest of our Snakes. It spreads over Australia and Tasmania, frequenting comparatively dry country, and is often found about logs and stumps. The ground colour varies a good deal, from light to dark brown, which may almost become black. This is crossed in the typical Tiger by about 50 bands of darker colour, though these may become quite indistinct, and in the dark varieties are scarcely to be distinguished from the ground colour.



From life. *C. Frost.*

Tiger Snake.

In Tasmania the dark snakes are called Black Snakes, and the lighter ones Carpet Snakes, but, whatever the reptile is called, it shows the same temperament, and must be dealt with with the greatest caution. If disturbed while mating, or if cornered in a hollow log, it becomes furious, spreads out the neck to twice the ordinary width, and with flashing red eyes darts at its enemy. The greatest number of the deaths from snake-bite in Australia must be credited to the Tiger. If fairly bitten on the bare skin, a man succumbs to the poison in from half an hour to an hour, and a dog in less than twenty minutes. It has the reputation of being pugnacious, when interfered with by other snakes, and is said to be always more than a match for the Black Snake. Professor McCoy kept some Tiger Snakes together in a box, and frequently noticed them bite each other viciously when stirred up, but there was no indication that they suffered from the poison. They feed mainly on lizards. In captivity they prefer mice and rats. On one occasion Professor McCoy saw the tables turned on the snake in an unexpected manner. He put a live mouse into a box in which he was keeping a Tiger Snake, to feed it, and was astonished next morning to find that the mouse had actually killed the snake instead, by biting the back of its neck, and had eaten some of its flesh. The Tiger Snake grows to a length of between five and six feet, but the snakes usually met with are smaller. The animal is very prolific, producing more young ones at a time than any of the other snakes, as many as fifty or more in a litter. In Tasmania the fecundity seems to be at its maximum.

From life. *W. Duke.*

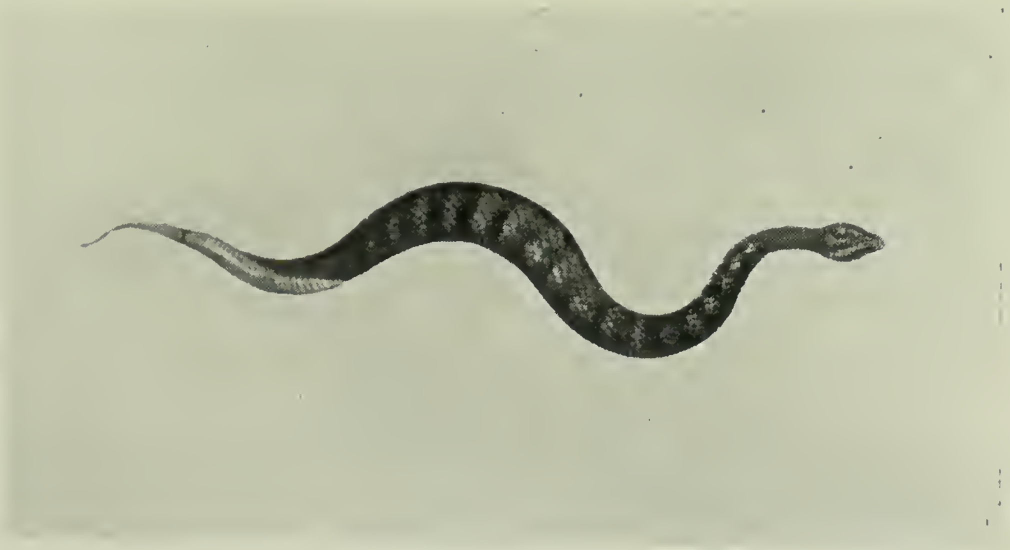
Tiger Snake.

Perhaps the most extraordinary situation in which a Tiger Snake has been discovered was observed by Mr. Scrivener, Government Surveyor, near Mount Wilson, in the Blue

Mountains. The snake was found enjoying a sun-bath, balanced on the topmost wire stretched between the posts of an ordinary wire fence. It lay along the wire, the folds of the body nicely adjusted on each side to maintain the delicate balance. To have reached this position must have been an acrobatic feat of high order. Admiration of its skill and ingenuity did not, however, deter the bushman from putting an end to the reptile. No one lets a Tiger Snake escape alive if he has the means to destroy it.

Genus Acanthophis.

Head and body viper-shaped. The maxillary bone carrying a poison fang followed by 1 to 5 small teeth. Scales of the front part of the body keeled. The sub-caudals in one row to the narrow part of the tail, which terminates in a long spine.



Death Adder. *McCoy Prod. Z.V.*

The Death Adder.

Acanthophis antarctica.

S 21—23, V 113—130, A1, SC 41—51. The Death Adder is a short, thick and clumsy reptile, rarely more than two feet long, and yet it is the most dangerous and probably the most deadly of our Snakes. Not that it is aggressive like the Tiger Snake, spoiling for a fight, but from the quite opposite character of remaining still, and of refusing to move out of the path of anyone approaching it. Its colours are so like that of the ground on which it lies, grey on grey sands, brownish or reddish on the sandstone stained with the oxide of iron, and brick red in the Central deserts, that it is not noticed, and may readily be trodden upon. Then it loses its lethargy, and strikes quickly.

Mr. Waite gives a remarkable example of the indifference which this snake displays to man. "An expedition was engaged in exploring the mountains of New Guinea. The nature of the country only allowed the party, which was thirty or forty strong, to march one behind the other in Indian file along a native footpath. Seeing a sudden disturbance in the rear, a halt was called, and the cause was found to be a Death Adder. A bare-footed native carrier had seen it lying in the path just in time to avoid stepping on it. Every man before him had stepped over it, missing his death by a hand's breadth. The footprint of the officer who had led the file was stamped in the clay but two inches from the adder's head." As we have said, the ground colour varies greatly; it is crossed by some forty to fifty dark bands in the typical and younger snakes, but these bands may disappear with age. The ventral scales vary too, and are clouded with black.

The Death Adder is found in sandy localities all over Australia, except in Southern Victoria, and occurs in New Guinea and the adjacent islands. It produces 10 to 15 young alive. The small spine at the tip of the tail is not at all a weapon of offence, but probably assists in locomotion. It is not as venomous as the Tiger Snake, but its fangs are longer.

Genus Furina.

Head small, not distinct from the neck. The maxillary bone carries a poison fang followed at a distance by one or two small solid teeth. Eye very small, with round pupil. Nasal scale single, body scales smooth, sub-caudals in two rows.

Verreaux's Snake.

Furina bimaculata.

S 15, V 181—200, A 2, SC 21—25. Brown with a black patch on the head and another on the nape of the neck, pale yellowish below. Length 13 inches. West Australia.

The Black and White Ringed Snake.

Furina occipitalis.

S 15, V 180—234, A 2, SC 14—25. The simplest to recognize of all our Snakes. It is about two feet long, the body and tail being circled by alternate black and white rings. On the head and neck the bands are limited to the upper surface. There are no teeth behind the tiny fangs in the upper jaw. All over Australia except in Southern Victoria.

Division Hydrophinae.

The Sea Snakes are inhabitants of tropical seas. Hence they are chiefly encountered off the coasts of the northern half of Australia, stragglers only occasionally coming as far south as Sydney. They pass their lives in the water, and soon die when brought on shore. They are most abundant amongst the reefs, or in salt-water estuaries, but do not ascend the rivers into the fresh water. They are adapted by their form to the life which they lead. The nostrils are situated on the top of the snout, so that they can breathe with nothing but a small portion of the head exposed above the surface. The nostrils are provided with a valve, which closes when the snake dives. The lung is capacious, extending as far back as the alimentary tract; hence the animal can either remain under water with a plentiful supply of air, or can float lazily on the surface without any effort. The tail is always enlarged and flattened into an organ which serves for propulsion and for steering. In nearly all the row of ventral shields, so conspicuous in the land snakes, is rudimentary or absent, and the under surface is keeled instead of being flattened. The scales do not usually overlap, and are

Austr. Mus.

Black and White Ringed Snake.

generally softer and less polished than in the land snakes. "The eye is small, with a round pupil, which is so much contracted by the light when the snake is taken out of the water, that the animal becomes blinded, and is unable to hit any object it wants to strike." The tongue is short. The Sea Snakes feed mainly on fish. Günther says: "I have found all kinds in their stomach, among them species with strong spines. As all these animals are killed by the poison of the snake before they are swallowed, and as their muscles are perfectly relaxed, their armature is harmless to the snake, which commences to swallow its prey from the head, and depresses the spines as deglutition proceeds." That the poison is deadly to man has been too frequently proved. It is, however, remarkable that in the Tongan and other Pacific groups of islands, the natives, including the children, when bathing, will play with these snakes, coiling them round their arms and necks as armlets and necklets, and have no idea whatever of their deadly character. Some of these snakes, forwarded to Sydney, were identified as the Ringed Sea Snake, *Platurus colubrinus*, so that there can be no mistake about the fact. The largest Sea Snake, which was identified and measured by Dr. Günther, attained a length of twelve feet, but such large forms have not been recorded from Australia. The young are produced alive in the water, are from four to nine in number, and are more brightly coloured than the adults. Dr. Günther inferred that they live to a great age, having seen very large examples of almost every species, exceptional size in a snake being associated with exceptional age. The chief enemies of the Sea Snakes are the Sharks and the Sea Eagles.

Key to the Genera.

A. Ventral shields small or absent. Nostrils on the top of the snout.	
No ventral shields.	Hydrus.
Ventral shields distinct, at least in front.	
No præocular scale.	Hydrelaps.
A præocular scale.	
The small teeth of the maxilla not grooved.	Hydrophis.
All the maxillary teeth grooved.	Distira.
B Ventral shields large.	
Nostrils on top of snout. 8-10 grooved teeth on the maxilla behind the fangs.	Aipysurus.
Nostrils on side of snout. 1 or 2 solid teeth on the maxilla behind the fangs.	Platurus.

The Yellow-bellied Sea Snake.

Hydrus platurus.

This Snake has a wide range in the Indian and Pacific Oceans, from Madagascar to Panama. It is the commonest Australian Sea Snake, and is not unfrequently driven on shore as far south as Port Jackson by heavy gales. It seldom exceeds 3 feet. It varies greatly in the distribution of the colours, black or brown and yellow. The Australian Snakes are usually black over the back, and yellow on the sides and belly; the tail black with yellow spots, or yellow with black spots. S 45—47.

The Port Darwin Sea Snake.

Hydrelaps darwiniensis.

Only two specimens of this Snake, the only species of the genus have been obtained, both from Port Darwin. Length 18 inches. Banded with alternate blackish and yellowish-white rings, the black bands broader than the white above, narrower below. Head dark olive spotted with black. S 27—29.

King's Long-necked Sea Snake.

Hydrophis kingii.

Both this and the next species are only known from the North coast of Australia. Length 4 feet. Greyish-white above, yellowish white underneath, with olive cross bands on the back, wider than the interspaces of ground colour. Head entirely black. S 37 keeled. In the genus *Hydrophis* the body is often very slender in front, rendering the neck more pronounced than in the other Sea Snakes.

The Elegant Long-necked Sea Snake.

Hydrophis elegans.

Length 4ft. 2in. (Waite). Yellowish-white; the back with transverse rhomboidal black spots, the belly with black spots or cross bars. Head blackish with a light crescentic mark across the snout. S 41—43, feebly keeled.

Genus Distira.

The genus ranges from the Persian Gulf to Japan and New Caledonia. The four Australian species are much alike in colouring, yellowish, olive, or brownish above with black cross bands on the back, or complete black rings; lighter beneath.

D. stokesii.	Length, 5 ft.	S. 48—57.
D. major.	Length, 3 ft. 6 in.	S. 36—41.
D. ornata.	Length, 4 ft.	S. 40—50.
D. grandis.	Length, 7 ft. 8 in.	S. 41—45.

The Brown Sea Snake.

Aipysurus laevis.

From Celebes to the Loyalty Islands. Uniform brown, or with small darker spots. Length 5ft. 9in. S 21—25, smooth.

Aipysurus australis is only known from New Guinea and Australia. Length 3ft. 3in. Brown or cream-coloured, with brown spots on the scales forming more or less distinct crossbars.

Genus Platurus.

Ringed Sea Snakes.

The members of this genus are less purely aquatic than the other Sea Snakes: they have overlapping scales, large ventral plates, and the nostrils on the side of the snout, just like the land snakes; and they have been frequently observed traversing the land, sometimes at a considerable distance from the water. The two species which live in Australian seas, *P. colubrinus* and *P. laticaudatus*, are much alike in form, colouring, and distribution. They both range from the Bay of Bengal to Fiji. Both are olive above and yellowish white beneath, and have from 30 to 50 black rings around the body.

P. colubrinus. Length 4ft. 3in. S 21—25.
P. laticaudatus. Length 3ft. 3in. S. 19.

"They are sometimes observed on the beaches around Port Jackson, and occasionally escape by wriggling into the water, a manœuvre of which the commoner Yellow-bellied Sea Snake is incapable." (Waite.)

ORDER EMYDOSAURIA.

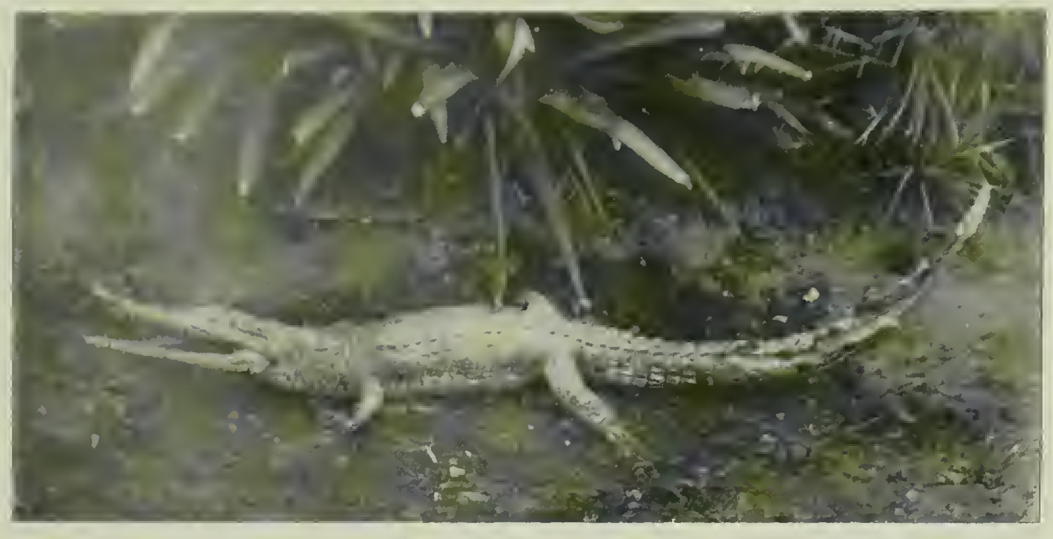
Head and jaws elongated; quadrate bone immovably united to the cranial arches; teeth numerous, conical, implanted in alveoli, special sockets in the jaws. Sternum and interclavicle present; seven or eight series of abdominal ribs. Ventricle of the heart divided into two separate cavities. A muscular diaphragm separating the pectoral and abdominal cavities.

Family Crocodilidae.

Nasal passages long, opening in front near the end of the snout, behind far back in the throat. Pupil vertical; upper and lower eyelids, and a nictitating membrane. No clavicles. Manus with five digits, pes with four; the three inner digits clawed. A dorsal armour of bony scutes. Oviparous, shell of egg calcareous.

Genus Crocodilus.

Fourth mandibular tooth usually fitting into a notch in the upper jaw; 16 to 19 teeth in the upper and 14 to 15 in the lower jaw on each side. In the Alligators of the New World a pit replaces the notch, and while the head is shorter the teeth are rather more numerous. Hind legs with a toothed crest behind. Toes more or less webbed.



From life. Johnston's Crocodile. *A. E. H. Mattingley.*

Johnston's Crocodile.

Crocodilus johnstonii.

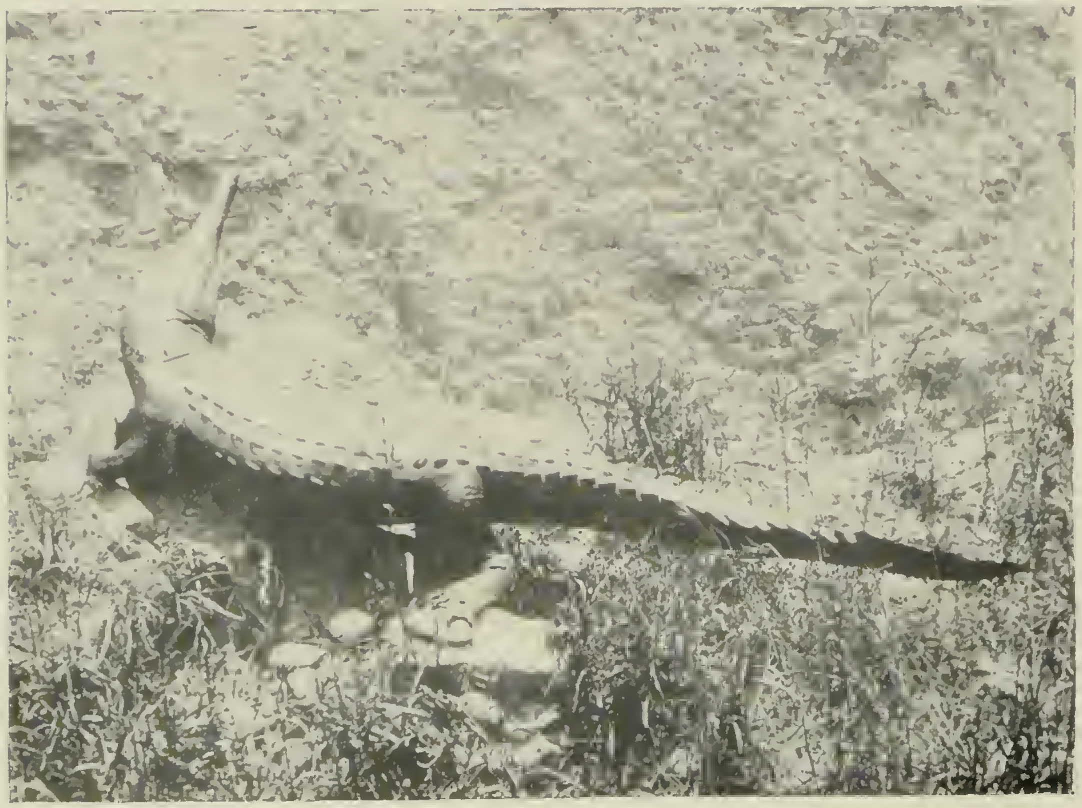
Snout very slender, gavial-like, the length about three times the width at the base, without distinct ridges; 19 upper teeth on each side. Four oval scutes in a transverse series behind the occiput; six large nuchal (nape) scutes, four in a square and one on each side; 19 transverse rows of dorsal scutes. Scales on the sides and limbs keeled. A serrated fringe on the outer edge of the leg. Fingers nearly free, outer toes extensively webbed. Olive-brown above, closely spotted with black; below yellowish. Length six or seven feet. Northern Territory and North Queensland.

These animals, though formidable looking, feed principally on fish, and are not dangerous to man, so that the residents will swim without fear in pools in company with the saurians.

The Salt-water Crocodile.

Crocodilus porosus.

Snout stout, the length about twice the width at the base, rough, with a more or less strong ridge on each side in front of the eye. No transverse series of scutes behind the occiput; four large nuchal scutes, forming a square with one or two smaller ones on each side; 16 or 17 transverse rows of dorsal scutes, 4 to 8 in a row. Scales on sides and limbs smooth, or feebly keeled. A serrated fringe on the outer edge of the leg. Fingers webbed at the base, outer toes extensively webbed. Adult dark brown above; young pale olive with large black spots on the body and tail, and dots on the head. Length to 17 feet or more. Distributed over India, Ceylon, Southern China to Northern Australia, the Solomons, and Fiji, entering salt water and frequently occurring out at sea.



Crocodilus johnstonii. *Austr. Mus.*

Mr. A. H. E. Mattingley gives the following account of this formidable beast, as met with in North Queensland:—

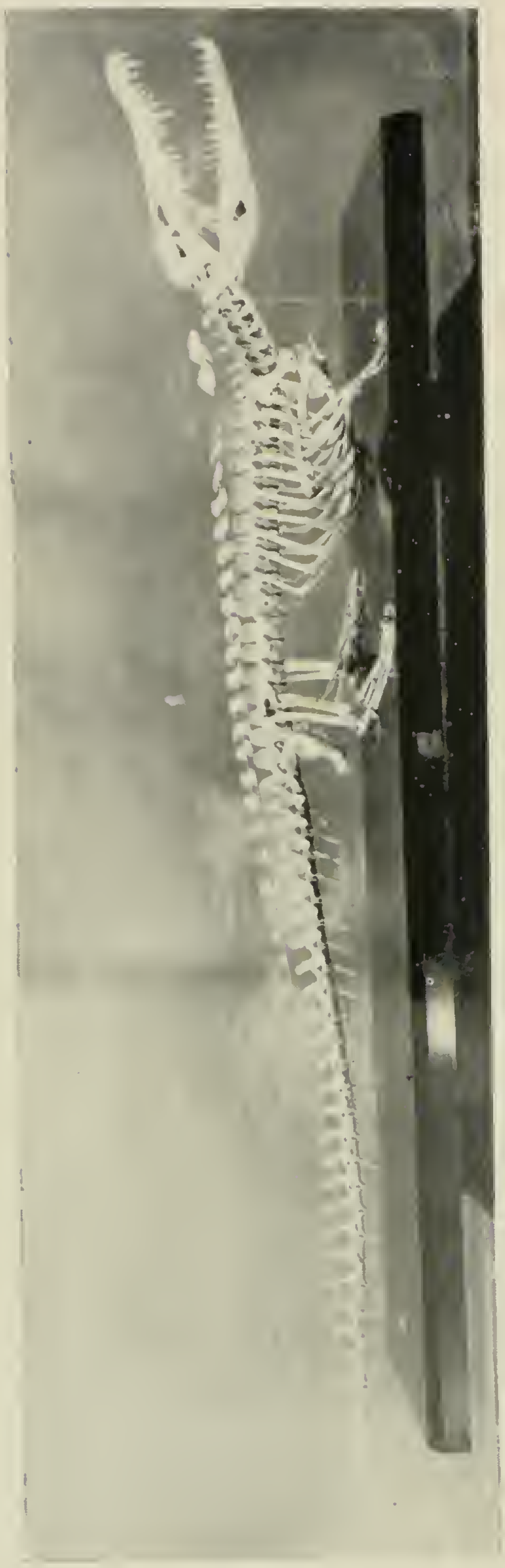
"Crocodiles infest the tidal mouths of the streams and vie with sharks in gobbling up the large Sand Mullet and other fish which abound in these genial tropical waters. They lay from 60 to 70 eggs, in a nest composed of mud and vegetable rubbish in the mangroves; the eggs are covered over by the mother with this vegetable material, which as it rots, assisted by the sun, generates sufficient heat to hatch out the eggs. The mother lies in a wallow alongside the eggs, in order to protect them from depredations of wild pigs and other enemies.

"One day, whilst collecting birds in the mangroves, I stumbled across a female crocodile in a wallow by her nest, and as I was looking upwards in search of birds I got within a dozen yards of her without knowing it. She soon let me know of her presence, however, by making a savage rush at me, uttering at the same time a kind of hissing, grunting noise; quick as lightning I discharged the contents of my gun, consisting of No. 8 shot into her eyes, completely blinding her; then running back I hastily loaded the gun with No. 2 shot, and approaching within about twenty-five feet I discharged the contents into her under the arm—the softest part—and so despatched her.

"It is a common error to suppose that a bullet will bounce off the skin of a crocodile. The best weapon undoubtedly is the shot gun, provided you use large shot and can get near enough to them. A crocodile's skin on the animal is as soft as raw bullock hide, but when removed it dries and assumes a hard and horny appearance. Of course the serrated ridges on the back, composed of plates of bone, will turn a bullet if struck sideways.

"On one occasion a friend of mine secured some crocodile eggs for blowing, and having placed them in a hat-box under his bed, forgot all about them. One day some time afterwards he was surprised to hear a great commotion in the house, and on rushing in found his wife and the black nursegirl on top of the bed screaming. It appears they were cleaning out the room, and happening to open the hat-box, some twenty-five little crocodiles started out and rushed round the room, snapping at everybody in a vicious manner, but they were soon despatched.

"The young crocodiles when hatched are provided with a small knob, as it were, of egg-like material, attached to their stomach, to enable them to survive until such time as they can assist themselves. This yolk is assimilated by the system, and takes the place of food, slowly disappearing as the little creature grows older, and is finally absorbed after about a month. It was this provision of nature which enabled them to live in the hat-box for some time without other nourishment."



Skeleton of Crocodile (C. porosus.)

Austr. Mus.

They choose clear spaces on the banks, fenced round by the dense scrub, as camping grounds, on which they will lie for hours sunning themselves. They are very quick in hearing any unusual sound, and at once slide off into the water. Hence they are difficult of approach. The wild pigs, which are abundant in the jungle-swamps, feeding on the roots of the rushes, often fall victims to the crocodiles. Though the reptiles are most abundant in the tidal estuaries, they will ascend the water courses, so that the clear pools of temptingly cool fresh water met with in the upper reaches are by no means safe for human bathers.

The eggs are very small in comparison with the size of the adult, and the eggs of *C. johnstonii* are only a little smaller than those of *C. porosus,* the dimensions of the latter in the Australian Museum being 2⅞ to 3 inches by 2 1-16th inches, those of the former 2¾ to 2⅞ inches by 1⅞. The length seems to vary more than the breadth in both. The eggs then are comparable in size with those of the Australian Gannet, and are smaller than those of the Musk Duck.

ORDER CHELONIA.

Reptiles with the body protected by a buckler or shell formed out of a combination of the expanded bones of the vertebral column and ribs and of dermal plates; pectoral and pelvic arches inside the ribs in the adult, clavicles present but no sternum; quadrate bone immovably united to the cranial arches; jaws covered with horny sheaths, without teeth. Ventricle of the heart single; diaphragm undeveloped. Oviparous.

The conspicuous buckler of these animals consists mainly of a dorsal shield, the carapace, and a ventral shield, the plastron. The carapace is composed first of a linear series of plates, the vertebral plates, which are the expanded and flattened heads of the spinous processes of a number of the dorsal vertebræ; these are flanked on either side by the costal plates, which are expanded ribs, each fitting in between the margins of two of the vertebral plates; and, lastly, the carapace is completed by a border of bony plates which grow in the skin, this rim of dermal plates comprising a single nuchal plate in front and one or two pygal plates behind in contact with the vertebral, and the 11 marginal plates on each side in contact with the costal plates. The plastron consists only of flattened dermal plates, formed in a linear series of pairs, and with a single unpaired plate, the intergular, which may reach the margin in front or be separated from it by the front pair of plates, the gulars. In some cases other dermal plates, the wings of the plastron, appear on the sides, uniting the carapace to the plastron.

As might be anticipated from the display of defensive armour, the animals are remarkable for their leisurely method of progression, especially on land. We have no Land Tortoises in Australia, all our forms swimming freely, and being found only in, or in the neighbourhood, of water. They feed slowly; breathe slowly by a process akin to swallowing, since the ribs are not movable, and there is no diaphragm; and, one is inclined to believe, think slowly. Still they are doubtless well adapted to mind their own business, and to enjoy in a quiet way their silent undemonstrative life. Of life they are exceedingly tenacious, undergoing long hibernations, and being able to subsist without food for long periods. The tissues and organs show evidence of vitality even after decapitation or other similar drastic treatment; thus the heart will continue to beat, in some cases for hours, after it has been removed from the body.

Family Sphargidae.

Body covered with a thick coriaceous skin concealing the carapace and plastron, smooth in adult, with an exoskeleton of small plates arranged like mosaic in the young. Four pairs of plastral plates. Limbs large, paddle-shaped, without nails or claws. Marine.

Genus Dermochelys (*Sphargis*).

Carapace completely, plastron incompletely, bony in the adult, the former with seven, the latter with five longitudinal ridges or keels. Carapace sub-cordiform, acutely pointed behind, with deep indentations in front, one over the neck, and one over each fore paddle. Head smooth in adult, covered with small shields in the young. Jaws very strong; upper with three deep triangular notches in front, with two sharply cut lobes between them; lower with an angular point in front, fitting into the central notch of the upper jaw.

The Luth.

Dermochelys coriacea.

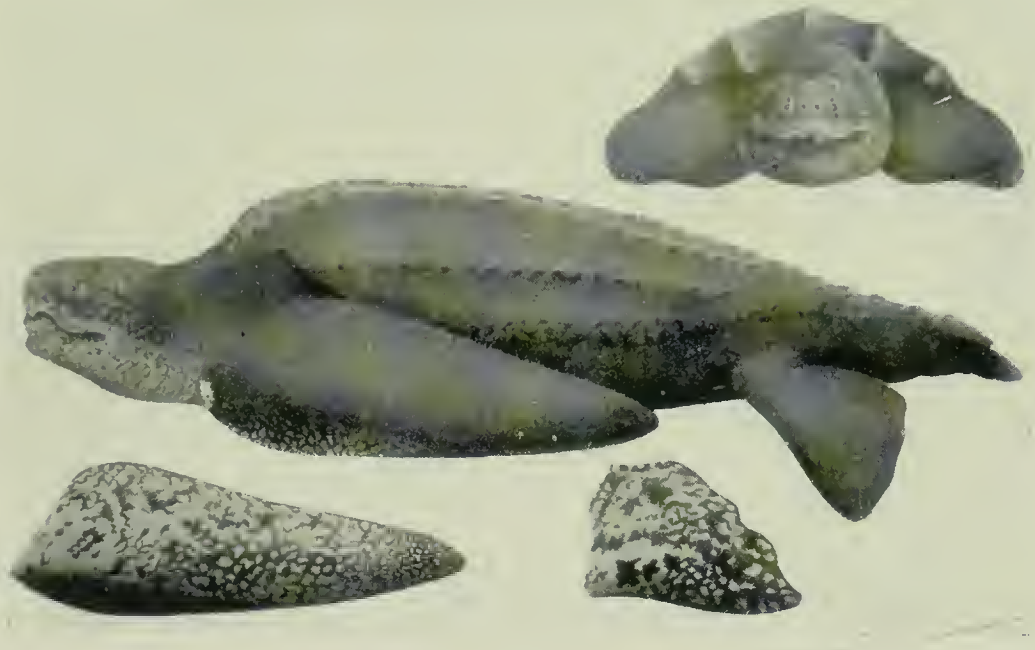
Fore limbs very long, narrow, falcate; hind limbs short, broad, with indications of the digits. Dark brown or purplish-black above; below marbled with more or less of a pinkish-white. The largest of the Chelonians, specimens having been recorded up to nine feet in length. Generally distributed throughout the tropical seas, an accidental visitor to the temperate coasts. One was captured as far south as Portland in Victoria, and numbers are occasionally brought to the Melbourne Fish Market.

Family Chelonidae.

Shields of the plastron widely separated from the marginals of the carapace. Limbs paddle-shaped with one or two claws. Marine Turtles.

Genus Chelone.

Carapace with persistent fontanelles between the costal and the marginal plates, with eight vertebral and eight pairs of costal plates, a broad nuchal, and a series of three pygals, the whole marked by an ornamental surface of horny scales or shields, 15 in number, of which four pairs cover the costal plates.



Luth. *Prodr. Zool. Vict.*

The Green Turtle.

Chelone mydas.

Carapace of young with one keel, of adult smooth, arched. Jaws not hooked, with denticulate edges. Limbs with a single claw. Colour of young dark brown or olive above, limbs margined with yellow; below yellow with a dark brown spot on the hand and foot. Colour of adult olive or brown, marked with yellowish. Length four or five feet, or more. Distributed over all the tropical and sub-tropical seas, visiting the coasts of North-west and North-east Australia to deposit the eggs.

The eggs are deposited in the sand at night, the turtles excavating deep holes with their hind flippers, and laying quickly large numbers of spherical eggs, like tennis-balls in appearance, slightly flexible and membranous. The damp sand is shovelled back over the eggs, and the surface smoothed over, and the animals beat a hasty retreat to the ocean. It is at this time that they are intercepted by the hunters, who incapacitate them by turning them over on their backs, and attend to their capture at their leisure.

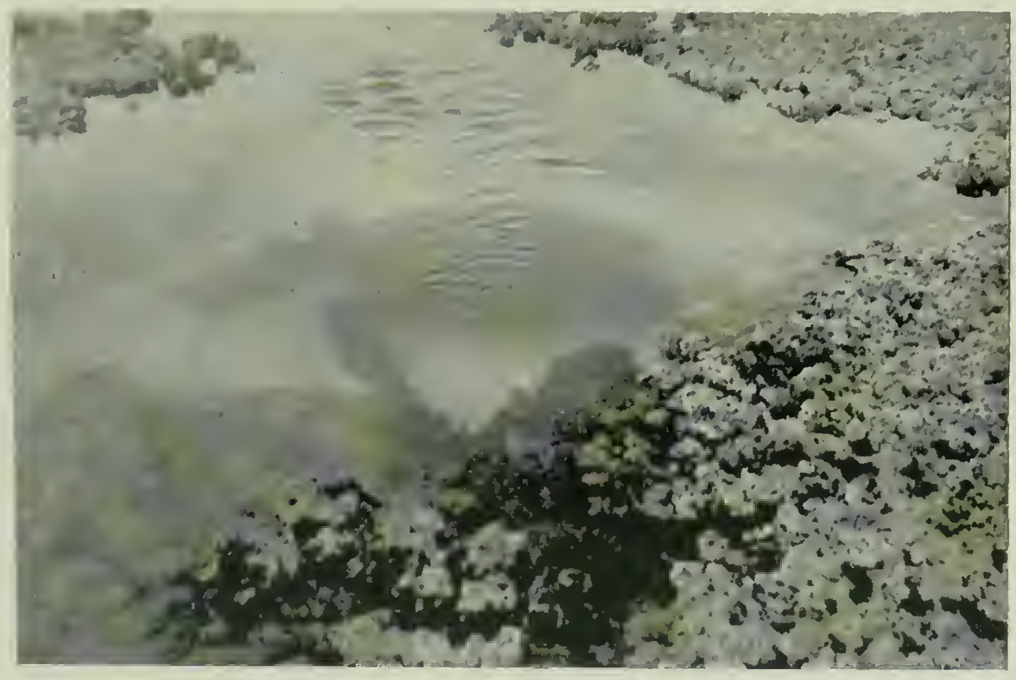
From life. Green Turtle. *A. R. McCulloch.*

Genus Natator.

Head and carapace covered with horny shields, each with two symmetrical areolæ; nuchal shield divided into two, each half having its own areola; five vertebrals and four pairs of costals; twelve pairs of marginals. Plastron as in *Chelonia*, with a well developed intergular. Head with a pair of large prefrontals; frontal in contact with the prefrontals and a pair of large supra-oculars; parietal shield very large and followed by a single post-parietal; two pairs of temporals. Upper jaw not hooked. Limbs paddle-shaped, with one claw each.

Natator tessellatus.

A new Turtle from Port Darwin described recently by Mr. A. R. McCulloch, and constituting a new genus. Colour brownish-olive above, with tortoiseshell markings, the areolæ and margins of the carapace of a lighter shade. Margins of the limbs and the under surfaces yellowish. Total length a little over six inches.



From life. Green Turtle swimming. *A. R. McCulloch.*

Genus Thalassochelys.

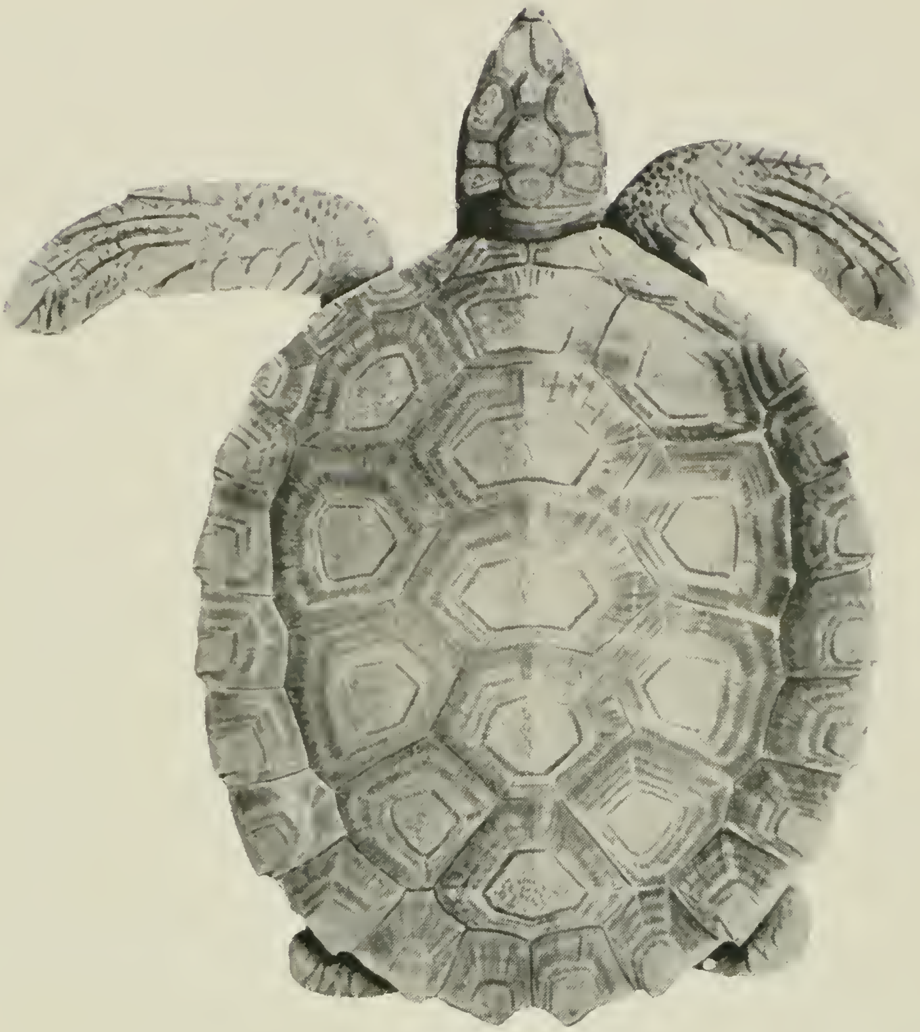
Carapace completely ossified in the adult, otherwise as in Chelone, except that the surface shields over the costal plates are in five or more pairs.

The Logger-head Turtle.

Thalassochelys caretta.

Carapace of young with three strong keels, of adult arched. Head large with very strong hooked jaws. Limbs of young with two claws, of adult with one. Colour of young dark brown or blackish above and below, of adult brown or reddish-brown above, yellowish below. Length about that of the Green Turtle. Tropical coasts and seas of Australia.

The powerful beak enables the Logger-head to crush molluscs and crustacea with thick shells. The Green Turtle with its weaker beak prefers the cuttle-fish and soft-bodied sea animals.



Rec. Austr. Mus.

Natator tessellatus.

Family Chelydidae.

Shields of the plastron in contact with the marginals of the carapace. Shell covered with horny shields. Neck bending under the margin of the carapace, always exposed. Tympanum exposed. Limbs with moderately elongated digits, latter webbed, with four or five claws. Eggs calcareous.

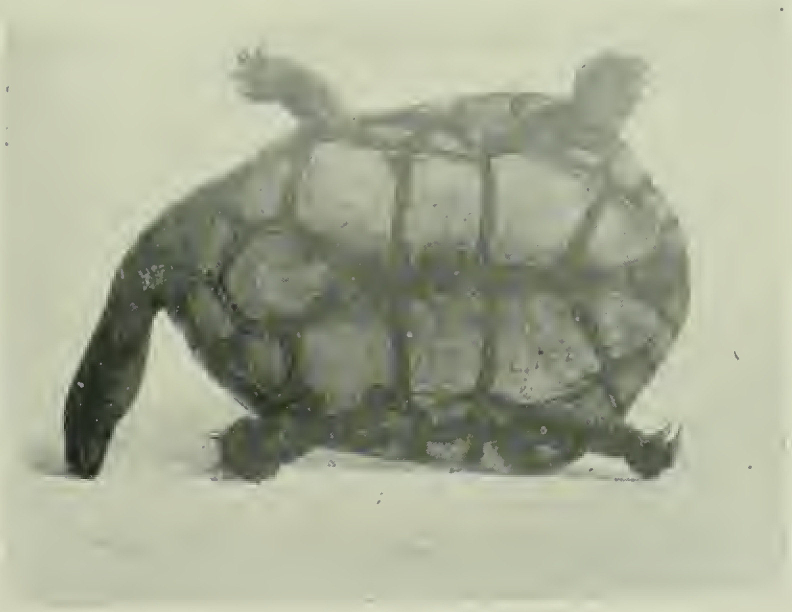
Genus Chelodina.

Neck longer than the dorsal vertebral column. No barbels on the chin. Carapace with five vertebral plates, four pairs of costals, a marginal nuchal, and a pair of pygals. Plastron with an intergular not reaching the margin, and six pairs of plates.

The Long-necked Tortoise.

Chelodina longicollis.

Head long, flat, covered with thin skin; muzzle short, broad; neck very long. Carapace much depressed, oval, narrower in front, with a deep wide groove in the middle line in the adult; nuchal plate much longer than broad. Plastron wide, rounded in front with a V shaped notch behind; intergular plate larger than the gulars. Colour very dark brown or blackish above, plastron and lower surfaces yellow with dark brown borders to the sutures between the plates, sometimes so wide as almost to obliterate the yellow ground colour. Length of carapace 7 to 9 inches, width from 5 to 6½ inches. Southern Australia from West to East.



Long-necked Tortoise. *Prodr. Zool. Vict.*

In October or November the tortoises prepare for their family duties by making a small circular hole with their hind feet in the bank in which to deposit their eggs. The excavation is about two inches in diameter at the surface and six inches deep, generally a little wider at the bottom. From 7 to 21 pure white eggs are laid. They are oval and elongated, 1 inch 2 lines long and 8 lines broad, and are not laid in any regular order, being in all positions. The hole is filled up with earth, and some mud pressed down over the top by the mother, which when it dries and hardens looks just like the surrounding soil. The nests are occasionally at a considerable distance from the water, in dry, hard soil. I captured one in January on the banks of the Macalister River, in Gippsland, and carried it with me for some hours. It possessed a remarkable odour of garlic, which indeed is a useful indication of the proximity of the tortoise. On being left in a bucket of water for an hour it surprised me by depositing four eggs in the water.

Long-necked Tortoise. *Prodr. Zool. Vict.*

The Lagoon Tortoise.

Chelodina expansa.

Carapace oval, neither keeled nor grooved; nuchal longer than broad. Plastron moderately wide. Colour dark brown above, pale brown below. Length of carapace to 11 inches. Queensland and Northern New South Wales.

The Oblong Tortoise.

Chelodina oblonga.

Carapace narrow, oblong, broader behind; males with a feeble vertebral keel; nuchal at least as broad as long. Plastron small, cruciform. Dark brown to black above, brown below. Length of carapace to 9 inches, but usually much smaller. North and West Australia.

Genus Emydura.

Neck shorter than the dorsal vertebral column. Chin with or without barbels. Limbs not fringed on the outer side.

The Murray Tortoise.

Emydura macquariae.

Shell depressed. Upper surface of neck with small rounded tubercles. Length of plastron more than three times the width. Small barbels present. Olive or olive-brown above, pale olive below; a yellow band passing from the angle of the mouth below the ear to the neck. Length of carapace eleven inches. South-eastern Australia in the Murray Basin. The eggs are ovate, bluntly rounded at each end, measuring 1 inch 7 or 8 lines by 1 inch 1 line.

Murray Tortoise. *Prodr. Zool. Vict.*

Krefft's Tortoise.

Emydura krefftii.

Like the preceding but without barbels. A yellow band from the eye to the ear. Length of carapace ten inches. Queensland.

The Small Tortoise.

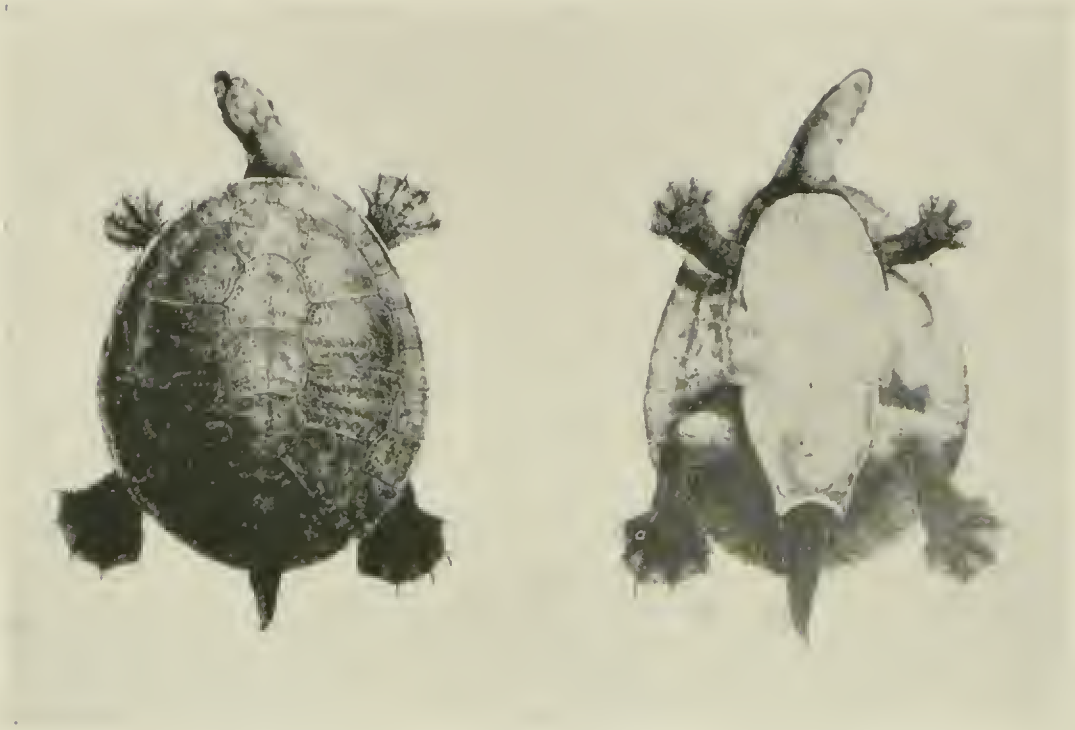
Emydura australis.

Shell convex. Upper surface of neck with small rounded tubercle. Length of plastron not more than three times its width. No barbels. Dark brown above, yellowish below. Length of carapace under six inches. Western Australia (?).

The Broad-bellied Tortoise.

Emydura latisternum.

Shell very much depressed. Head large, snout very prominent. Upper surface of neck with erect conical tubercles. Barbels conical, well developed. Brown above, yellowish or brownish below; a whitish band may be present along each side of the neck. Length of carapace nine to ten inches. Queensland.



Murray Tortoise. *Prodr. Zool. Vict.*

Genus Elseya.

Chin with well developed barbels. Limbs strongly fringed on the outer side. Otherwise much like *Emydura.*

The Northern Tortoise.

Elseya dentata.

Shell depressed. Head rather large, snout prominent. Limbs very broadly webbed. Dark brown above, yellowish or brown below. Length of carapace eleven inches. Northern Australia.

ORDER LACERTILIA.

The Lizards.

Terrestrial Reptiles with the head, and usually the body, covered with scales. Quadrate bone jointed to the skull. Eyelids present. Teeth fixed to the jawbone. Legs usually four, sometimes aborted. There are nearly 400 Australian species.

Family Geckonidae.

Head and body more or less depressed. Tongue fleshy, capable of protrusion out of the mouth. The eye generally large, with vertical pupil, covered as in snakes by a transparent lid under which it moves freely, the valvular lids being generally rudimentary. The tympanum usually more or less exposed.

Limbs, both pairs well developed, with five digits. The digits vary considerably, and furnish the characters upon which the classification is based. The tail presents almost every possible shape, sometimes prehensile, almost always extremely fragile, and rapidly reproduced. If reproduced it generally assumes an abnormal form and scaling.

The skin is nearly always soft, with numerous tubercles or granules on the upper, and small overlapping cycloid or hexagonal flat scales on the lower surfaces. The plate-like scales of the head are limited to the region around the margin of the gape. The Geckoes reproduce by means of eggs. The eggs are round with a hard shell.

The colour of the dorsal surface is in some cases variable at will, as in the case of the chameleon, and assimilates the animal in the daytime, when it wishes to escape notice, to the tint and style of colouring of the bark or the rock on which it rests. The Geckoes hunt for insects and worms by night, and in the day avoid the sunlight, hiding in crannies of the rocks or under stones or the bark of trees. The tongue is fleshy, and can be protruded to some extent; the prey is caught and swallowed whole, the gullet being capacious. The limbs are strong, with rather short toes, furnished with sharp claws, like a cat's, or more often with adhesive pads, like those of a fly's foot, so that they can run up and down walls or rock faces or trees with great ease. In the North they come into the houses, and astonish the inhabitants by their feats of climbing. They are quite harmless, and really very useful as destroyers of insects. Many Geckoes make a clicking sound by a movement of the tongue against the palate. and thus have gained their name from the Gecko. Chucko. Chick Chick or Tockee. which are the nearest equivalents which observers have found for the click.

Synopsis of the Genera (after Boulenger).

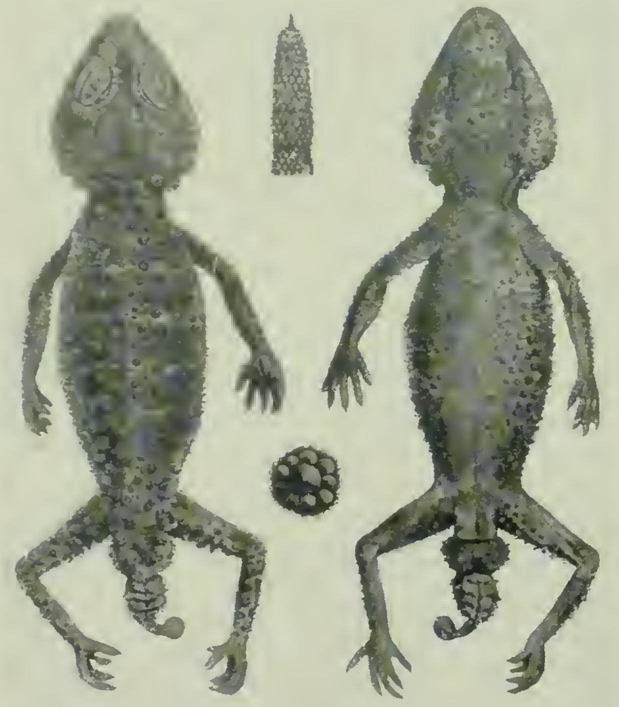
1. Digits short, cylindrical, the skin swollen on the palmar surface and under the articulations.	
Digits clawed, tail extremely short, terminating in a globular knot.	Nephrurus.
2. Digits straight, not dilated, clawed, without pads.	
Digits granular inferiorly, not fringed laterally; rostral and mental plates projecting, nail-like.	Rhynchœdura.
Digits covered inferiorly with small imbricate pointed scales; dorsal scales small.	Ceramodactylus.
3. Digits not or but slightly dilated at the base, the two or three distal joints more or less compressed and angularly bent, inferiorly with a series of transverse plates; all the digits clawed.	
Claw between two scales, a smaller superior and a large latero-inferior.	Gymnodactylus.
Claw between three scales, a smaller superior and two larger latero-inferior.	Heteronota.
4. Digits dilated at the apex, which is furnished inferiorly with two plates separated by a longitudinal groove.	
Digits not dilated at the base, clawed, the distal expansion covered above with scales markedly different from those of the basal part.	Phyllodactylus.
No claws.	Ebenavia.
Digits not dilated at the base, clawed, the distal expansion covered with small scales like those on the basal part.	Diplodactylus.
Digits dilated at the base, the basal expansion anteriorly with paired oblique lamellæ.	Œdura.
5. Digits dilated, the distal phalanges compressed.	
A. The distal joint long, free, rising from within the extremity of the digital expansion.	
Infradigital plates in a single or double series, inner digit clawless.	Gehyra.
Infradigital plates in a single series, inner digit rudimentary, of fore limb clawless, of hind limb clawed.	Perochirus.
B. The distal joint at the extremity of the digital expansion; a double series of infradigital lamellæ. Pupil vertical; distal joint of digits short; thumb clawless.	Lepidodactylus.
C. The free distal joint at the extremity of the digital expansion; a single series of infradigital lamellæ. The slender distal portion of the digit forming an angle with the dilated basal portion.	Hoplodactylus.

Genus Nephrurus.

Head very large. Eye large conspicuous, pupil vertical. Limbs long and slender. Tail with a terminal enlargement. Marked constrictions at the neck and the junction of the tail. Australia.

N. asper.

Body and limbs above rough with round groups of conical spinose tubercles. Tail small, swollen at the base, tapering behind, and ending in a globular knob. Pale pinkish-brown above, with a blackish band across the neck and a black network of lines on the head. Length 4½ inches. Found in Central Australia and Eastern Queensland.



Nephrurus asper. *Brit. Mus. Cat.*

N. laevis.

Body and limbs above smooth with only small granules. Tail nearly as large as the head, not swollen at the base, tapering rapidly behind, and ending in a very small rounded enlargement. Rusty or greyish-brown above, with a number of light and dark cross bands. Length 5 inches. Found under logs and stones in West and Central Australia and in North Queensland.

Genus Rhynchoedura.

Head long; snout long, the rostral and mental plates projecting, nail-like. Pupil vertical.

R. ornata.

Head like that of a young bird, snout pointed and compressed. Body slender, covered with small granules. Limbs moderately long, outer toe inserted far down. Tail rather thick. Light greyish-brown above, each side festooned with blackish-brown half rings. Length under 3 inches. North-west Australia.

C. Frost.
Nephrurus laevis.

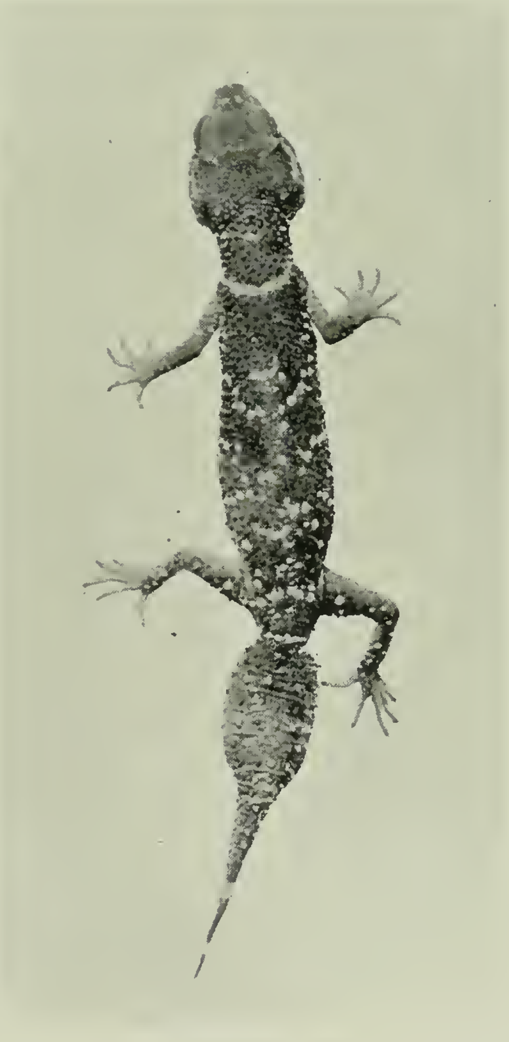
Genus Ceramodactylus.

Head large. Pupil vertical. Digits as in synopsis. Males with præanal pores.

Lizards found hibernating under stones.
Gymnodactylus miliusii. Lygosoma (Hinulia) tæniolata.

C. damaeus.

Body above with small granular scales. Limbs moderate. Tail long, slender, tapering, greyish or brownish above, a reddish or brownish band along each side of the back. Head spotted or reticulated with the darker colour; sides with two longitudinal series of roundish white spots. Length 3½ inches. Central Australia.



C. Frost.

Gymnodactylus miliusii.

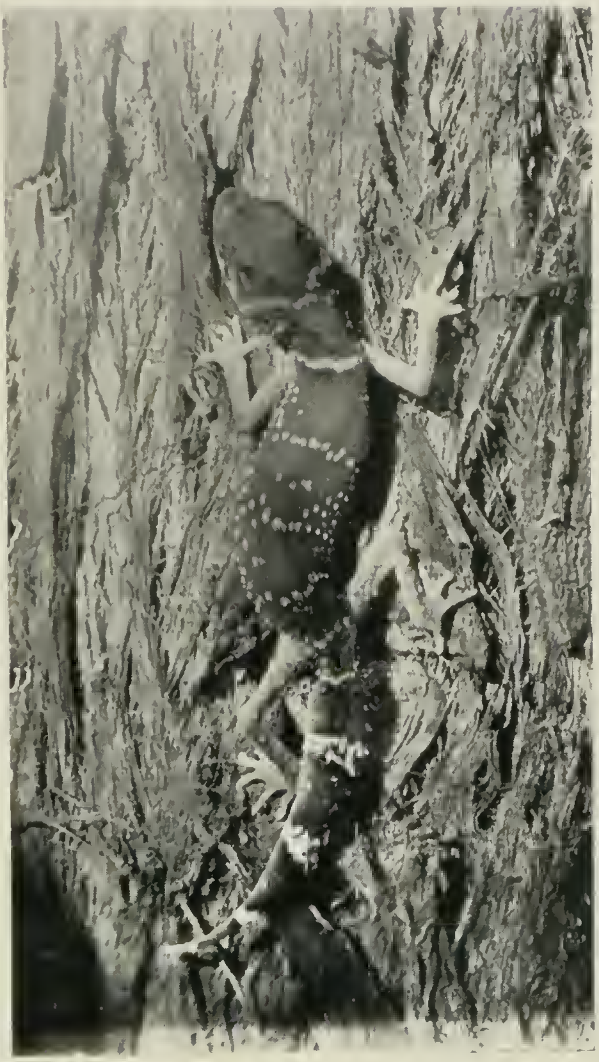
The other species of the genus are recorded from Arabia and Persia.

Genus Gymnodactylus.

Tropical America, the Islands of the Pacific, Australia, Southern Asia, and the borders of the Mediterranean.

G. pelagicus.

Tail not swollen, cylindrical, tapering. Back with 16 to 20 longitudinal series of round subconical ribbed tubercles. Dark brown above, lighter beneath. Length 5 inches. A tree Gecko. Pacific Islands, New Guinea, Cape York.



From life. Gymnodactylus miliusii.

G. miliusii.

Tail short, thick, swollen, tapering gradually to a fine point. Back with small granular scales intermixed with round conical tubercles. Chestnut-brown above with white crossbands over the back and tail, below greyish-white. Length 5½ inches. Found under the bark of trees. The Southern half of the Continent.

G. sphyrurus.

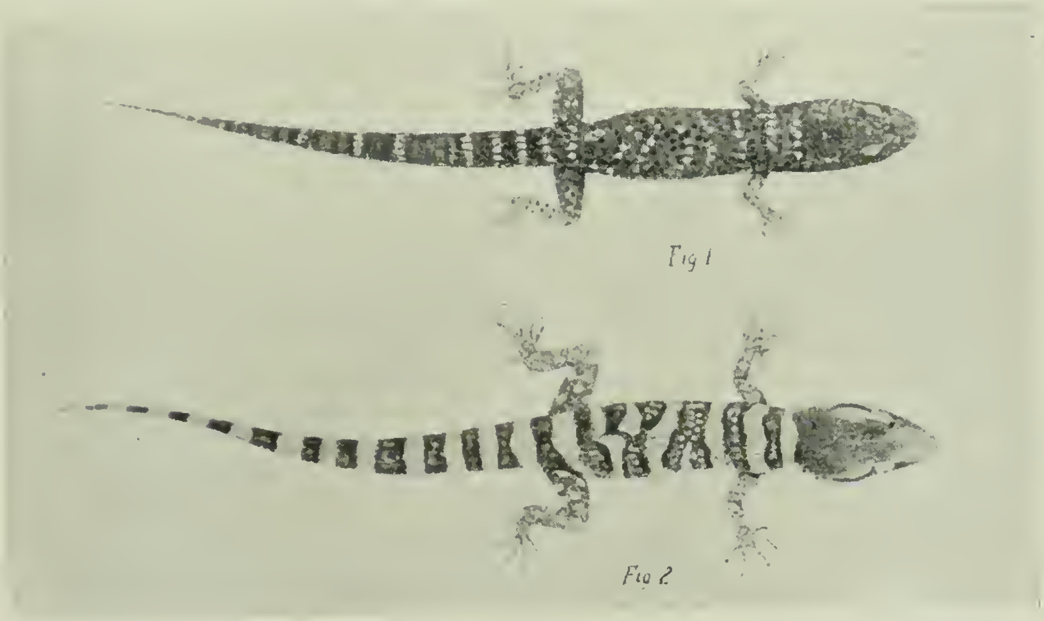
Tail hammer-shaped with an expanded quadrilateral basal, and an attenuated apical portion. Otherwise much like the preceding. Length 3½ inches. A solitary specimen from the interior of New South Wales.

G. phyllurus.

Tail short, flat, and leaf-like. Head much flattened, limbs long. Back covered with small granules, intermixed with conical, more or less spinose, tubercles. Brown above mottled with darker, below light brown, often dotted with darker. Length 7½ inches. Found in chinks or on ledges of damp rocks. New South Wales and Queensland.

G. cornutus.

Like the preceding but larger, and with an arched row of six strong conical tubercles on the nuchal region. Length 8½ inches. Bellenden Ker Range, Queensland.



Horn Exp.

Heteronota bynoei. Two colour patterns.

Genus Heteronota.

Australia, extending across the continent from West to East, but wanting in the South-east. Pupil vertical; males with præanal pores.

H. bynoei.

Slender Geckoes with rather large oviform head and long cylindrical tapering tail. Body covered above with small keeled granules and large keeled tubercles. In the type light brown above, with dark transverse bands, seven on the body, and up to twelve on the tail; but the colour is often broken up, the bands becoming indistinct or lost. Length rather over 3 inches. Found under logs and stones. Distribution of the genus.

Genus Phyllodactylus.

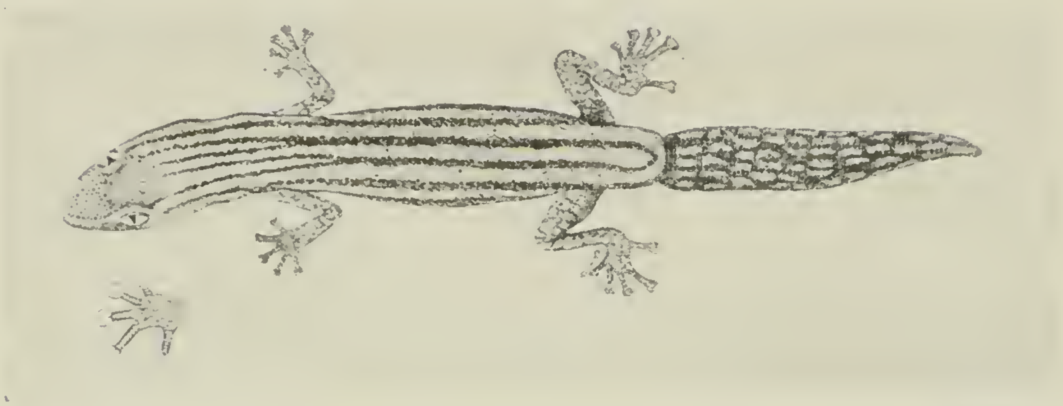
Tropical America, Africa, and Islands of the Mediterranean, Australia. In all the Australian species the back is covered with uniform small granules.

P. marmoratus.

Dorsal scales not keeled; digital expansion much smaller than the eye; greyish or reddish above, variegated with dark brown. Nearly 5 inches. Found under logs or flat stones. West and South Australia and Victoria.

P. macrodactylus.

As in preceding, but rather shorter; digital expansion nearly as large as the eye. Probably New South Wales.


Horn Exp.

Ebenavia horni.

P. guentheri.

As in preceding, under $4\frac{1}{2}$ inches; digital expansion three-fifths the diameter of the eye. Claw raised above the digit and exposed. West Australia and New South Wales.

P. ocellatus.

Dorsal scales feebly keeled; tail prehensile; back marked with two rows of light coloured ocelli. Length about 2 inches. West Australia.

Genus Ebenavia.

Of the three species known, two are from Madagascar, while the following has been found only in the Centre of Australia.

E. horni.

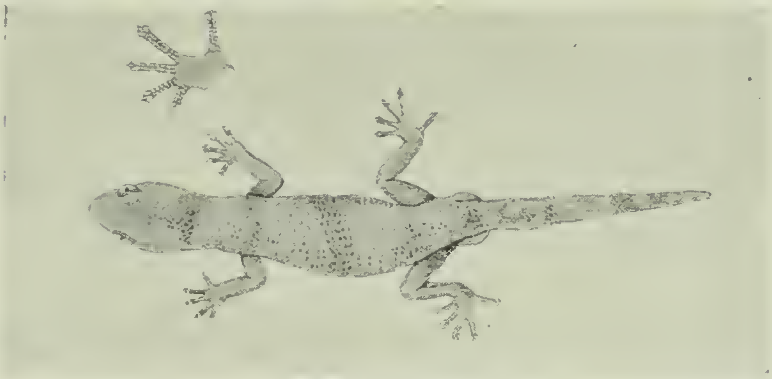
Olive-brown above with four dark bands along the back, and one on each side. Tail with annuli of small smooth scales, marked with rows of light ocelli. Length a little over 2 inches.

Genus Diplodactylus.

Geckoes with oviform heads and rather short pointed tails. Upper surfaces with juxtaposed scales. Confined to Australia.

Key to the Species.

I. Back with larger tubercles amongst the granular scales. Males with præanal pores.	
Tubercles of back in two rows. Superciliary border and tail with long spines. Length 5 inches. Australia except South-East and East. Found under the bark of trees.	D. ciliaris.
Tubercles of back scattered. Tail only with spines. Length only 4½ inches. West and North.	D. spinigerus.
Tubercles of back in two rows. No spines. Length 4½ inches. Victoria and New South Wales.	D. strophurus.
As in preceding, tail with transverse bands of strong tubercles. Length 4 inches. New South Wales.	D. intermedius.
Tubercles of back numerous in several rows. No spines. Length 3 inches. Central Australia.	D. byrnei.

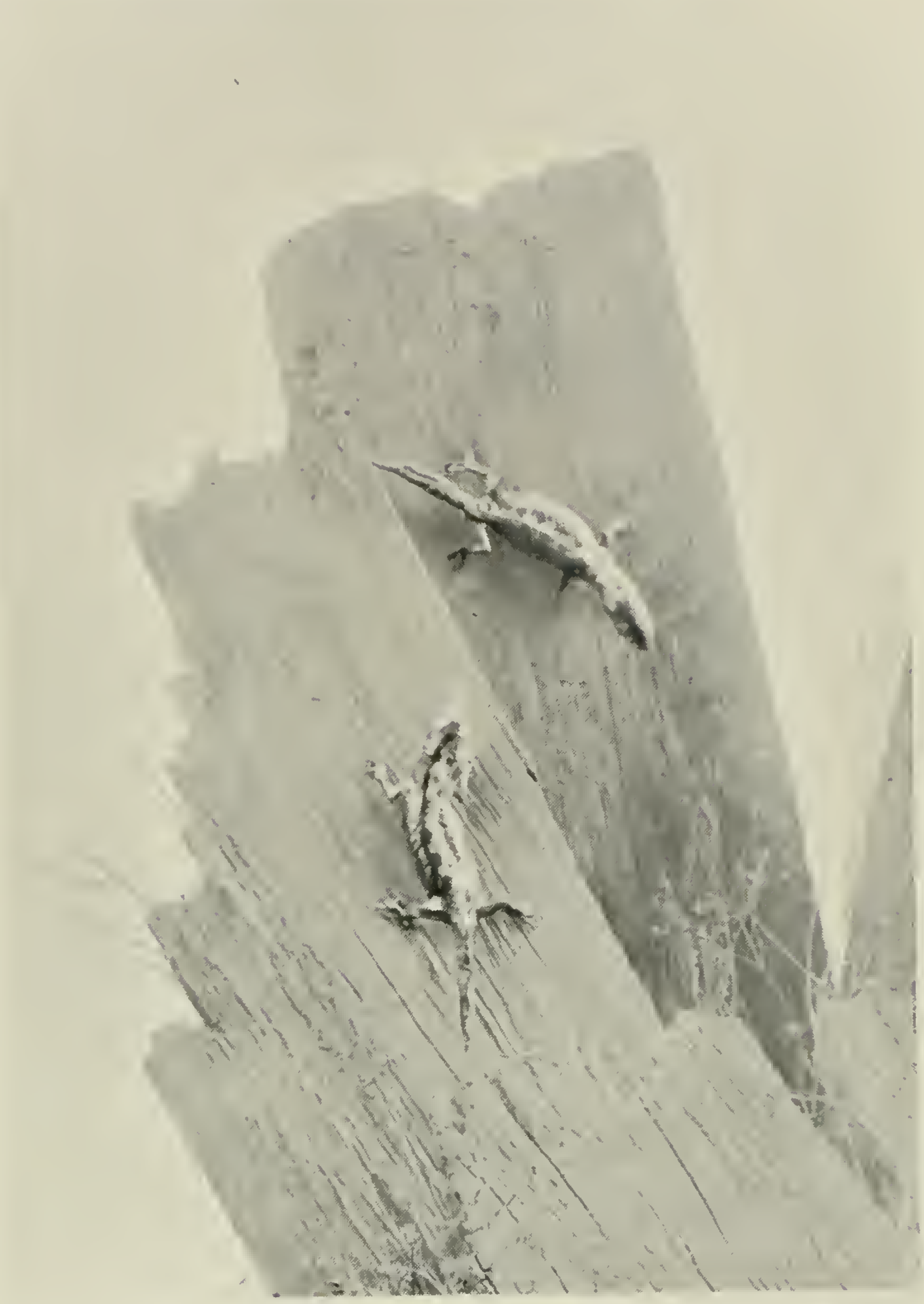


Diplodactylus byrnei. *Horn Exp.*

II. Back with uniform granules. Males without præanal pores.	
A.—Digits with large transversely dilated tubercles below.	
Digits short, depressed, with oval tubercles below. Length 3½ inches. Under stones. West Australia. Victoria, New South Wales. Brown above; a light dark-edged festooned vertebral band, bifurcating on the nape. Sides and limbs with light spots. Below dirty white.	D. vittatus.
Digits longer, slender, with round tubercles below. Length 3 inches. West and North Australia.	D. polyophthalmus.
B.—Digits with small round tubercles below.	
Dorsal scales small granular. Three dark spots on the middle line of the back Length 2½ inches. New South Wales.	D. steindachneri.
Dorsal scales small granules. Light transverse bands on the back and tail. Nearly 3 inches. North-West Australia.	D. pulcher.
Dorsal scales large, flat. Greyish marked with brown. Length nearly 3 inches. West and Central Australia and Victoria.	D. tesselatus.
Dorsal scales large and flat in the middle of the back. Pinkish-grey with transverse brownish-black reticulations. Length under 3 inches. Central Australia.	D. conspicillatus.

Genus Oedura.

In shape much like preceding, head larger, tail broader. Confined to Australia.



Diplodactylus vittatus. *Austr. Mus.*

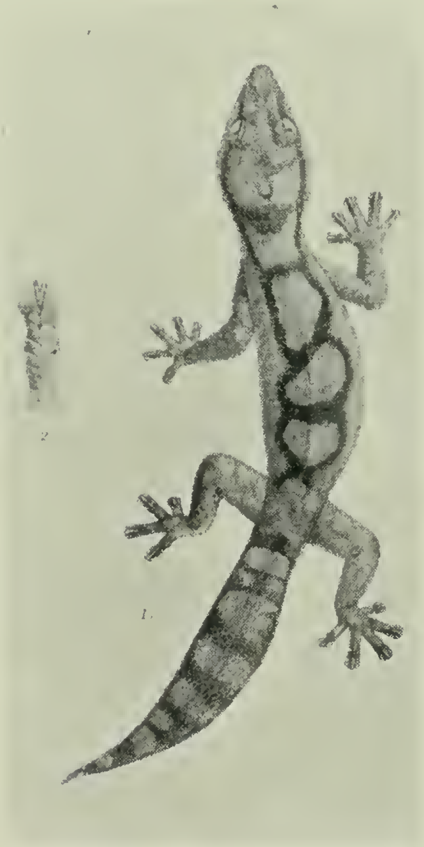
1. Dorsal scales flat.

Oe. marmorata.

Tail much depressed, as broad as the body. Dark brown above, with whitish spots and cross bands, five on the body. Nearly 6 inches. West, Central, and North Australia.

Oe. tryoni.

Tail not much depressed, much narrower than the body. Above marked with numerous light ocelli. Nearly 6 inches. Central Australia and Queensland.



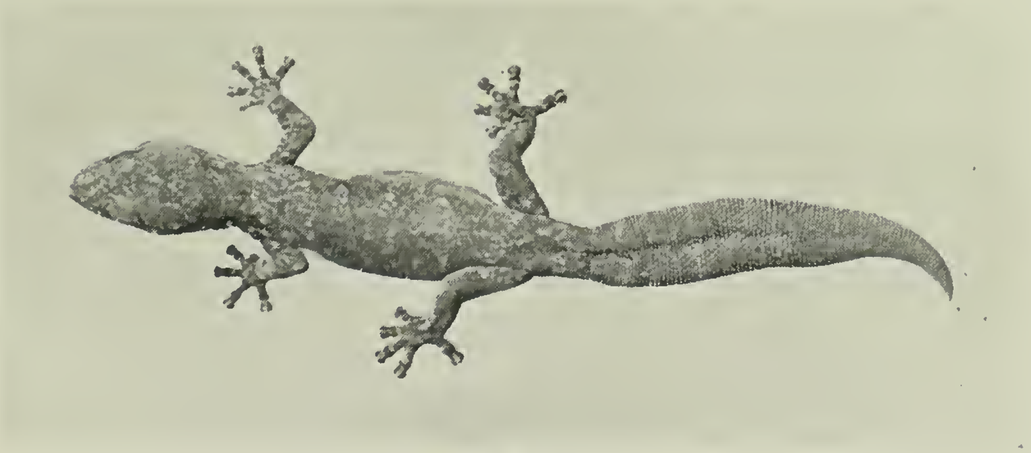
Brit. Mus. Cat.

Œdura robusta.

2. Dorsal scales small granular.

Oe. robusta.

Four divided lamellæ under the median toes. Tail much depressed. Two wavy dark bands along the back united by four or five cross bands.

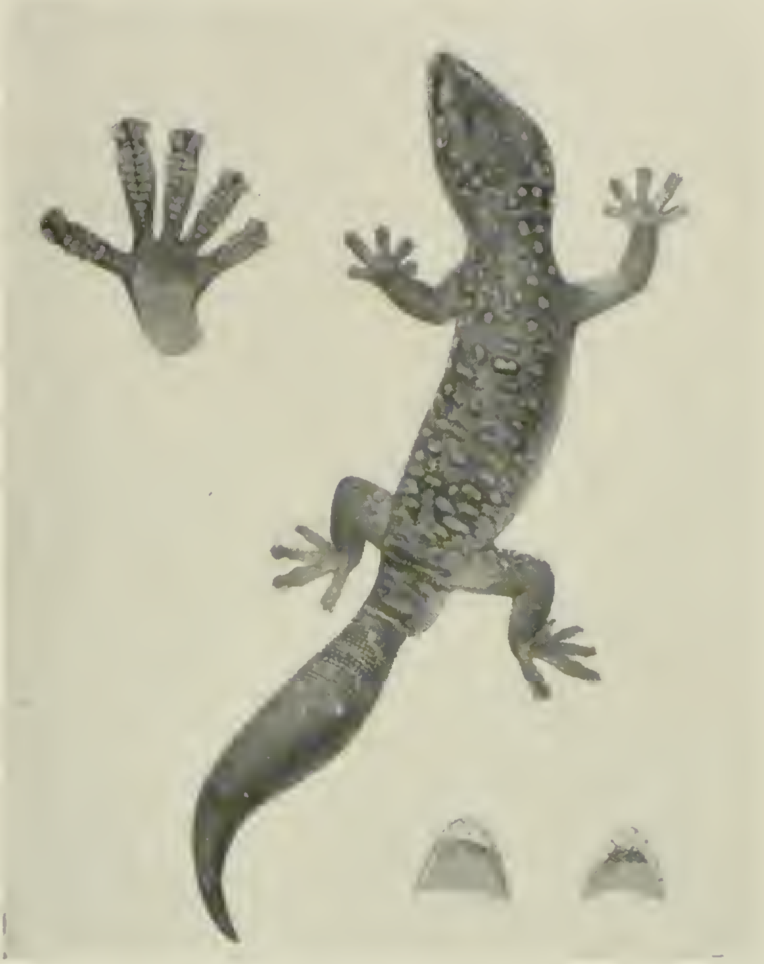


Œdura lesueurii. *C. Frost.*

Length 5 inches. West and Central Australia, New South Wales and Queensland.

Oe. lesueurii.

Two or three divided lamellæ. Tail depressed. Purplish-brown above, with two narrow zig-zag dark brown lines along the back. Length 4 inches. Under stones. New South Wales and Queensland.



Œdura ocellata. *Brit. Mus. Cat.*

Oe. rhombifera.

Two or three divided lamellæ. Tail cylindrical. Colour much as in preceding. Length 4½ inches. Queensland.

Genus Gehyra.

West Coast of Mexico; East Indies, Pacific Islands, Australia.

The two Australian species are very much alike, but in *G. variegata* the digital lamellæ are divided by a median groove, which is absent in *G. australis*. The colours of each are brown above, variegated with darker and lighter spots. The length is about six inches. *G. variegata* extends over the continent, but *G. australis* seems to be confined to the West and North. They are found under logs and under the bark of trees.

Of the remaining genera of Geckoes *Perochirus mestoni* has been described from Queensland, and *Lepidodactylus pusillus* from West Australia, while *Hoplodactylus tuberculatus* is found in Queensland, the other species of the genus occurring in Southern India and in New Zealand. *Hoplodactylus* is the only genus of Geckoes which is represented both in Australia and in New Zealand.

Family Pygopodidae.

Elongated snake-like Lizards, allied to the Geckoes in the structure of the skull. The fore limbs are entirely wanting, and the hind limbs appear externally only as scaly flaps. Hence the larger forms are constantly mistaken for snakes. The tongue is fleshy, elongate and extensible. The eye is rather small, with a broadly elliptical vertical pupil, and is not protected by movable lids, but usually has a rudimentary circular scaly lid. The body is covered with roundish, overlapping scales, while the head is regularly plated with larger scales (smaller in *Lialis*). The tail is long and brittle. The family is exclusively Australian, except that *Lialis* extends to New Guinea. They live in holes in the ground, or lie under stones, coming out in the summer, feeding usually in the evenings.

Key to the Genera.

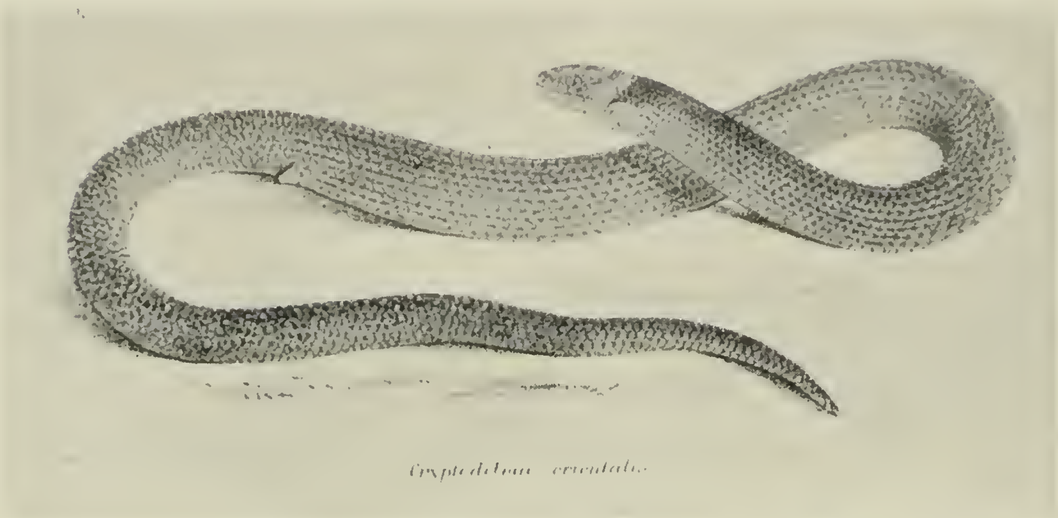
I. Parietal bone distinct. Head with large symmetrical shields.	
A.—Præanal pores.	
Dorsal scales keeled.	Pygopus.
All scales smooth.	Cryptodelma.
B.—No præanal pores.	
Scales each with two keels.	Pletholax.
Scales smooth.	
Parietal plates large. Ear exposed. Two rows of enlarged ventral plates.	Delma.
Parietal plates large. Ear hidden. All scales subequal.	Ophidiocephalus.
No parietal plates. Ear hidden. All scales subequal.	Aprasia.
II. Parietal bone single. Head covered with small plates.	Lialis.

The Common Slow-Worm.

Pygopus lepidopus.

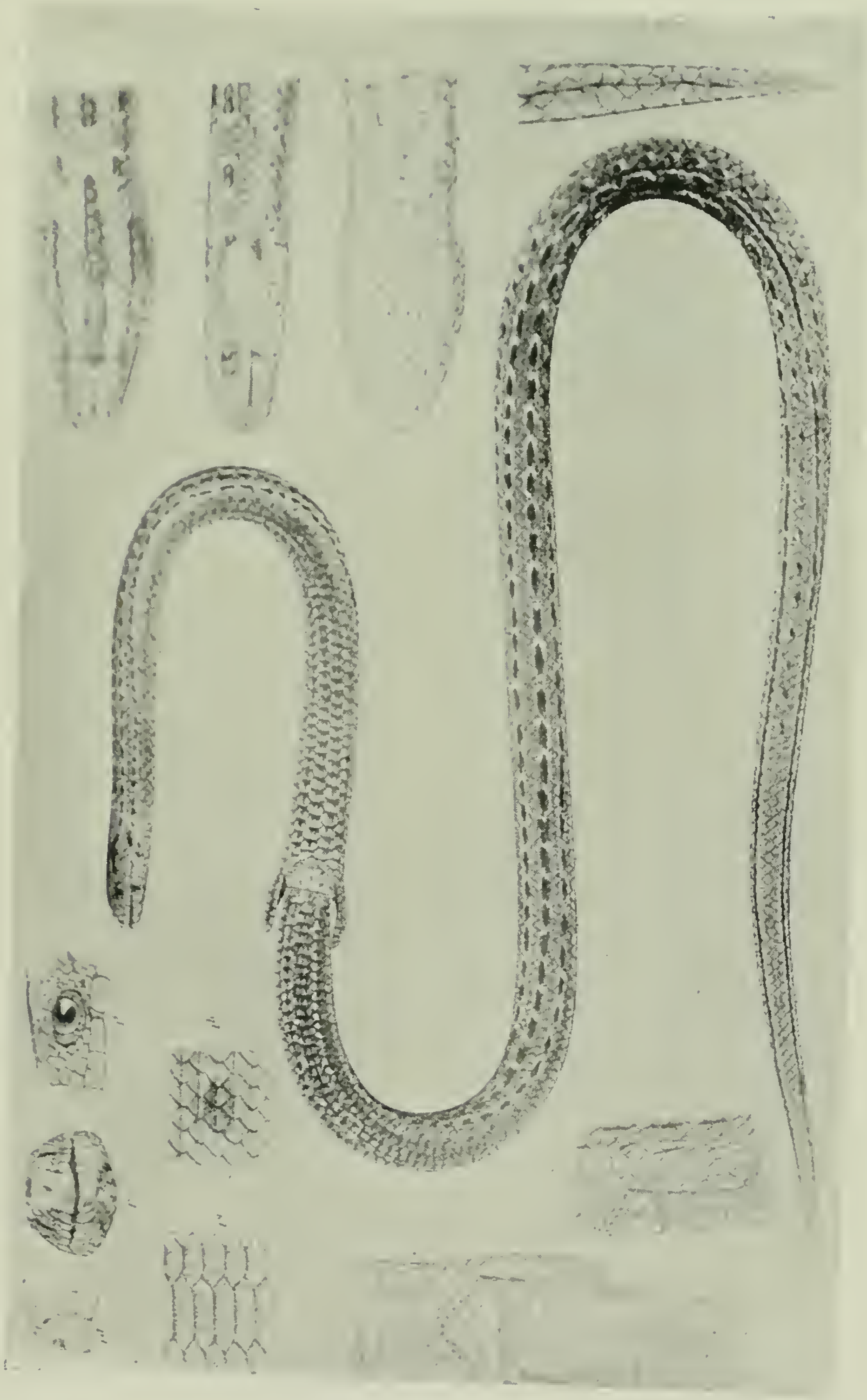
Head rounded in front. Ear exposed. Twenty-two scales round the middle of the body, twelve keeled. Colour very variable. Coppery grey, brown or lavender above, uniform, or with three or five longitudinal rows of blackish dots, or sometimes of elongated quadrangular black white-edged spots; below marbled or netted with dark grey. Length to nearly two feet, of which nearly three-fourths belong to the tail. Australia and Tasmania.

The Slow-Worm, like the *Anguis fragilis* of Europe, is very generally considered by people who meet it as a snake, and suffers for the resemblance. In the simple structure of the lower jaw, like the other members of the family, it shows a closer resemblance to the snakes than does the European Slow-Worm. It is of course perfectly harmless, and it can be easily recognized by its keeled scales, which give it a rough unsnakelike look, even if the stumps of the hind legs cannot be seen. It is remarkable for its brittleness. If the tail be seized, the part held is left at once in the captor's hand, while the rest of the animal wriggles up quickly to shelter. An individual seized by the head and placed in a box or bag will very likely be found to have voluntarily snapped its long tail into three or four pieces. As with the Geckoes, a lost tail is easily replaced by another growing in its place, but the reproduced tail is always shorter and differs in the scaling and colouring.



Brit. Mus. Cat.

Cryptodelma orientalis.



McCoy Prod. Z.V.

Pygopus lepidopus.

The Black-headed Slow-Worm.

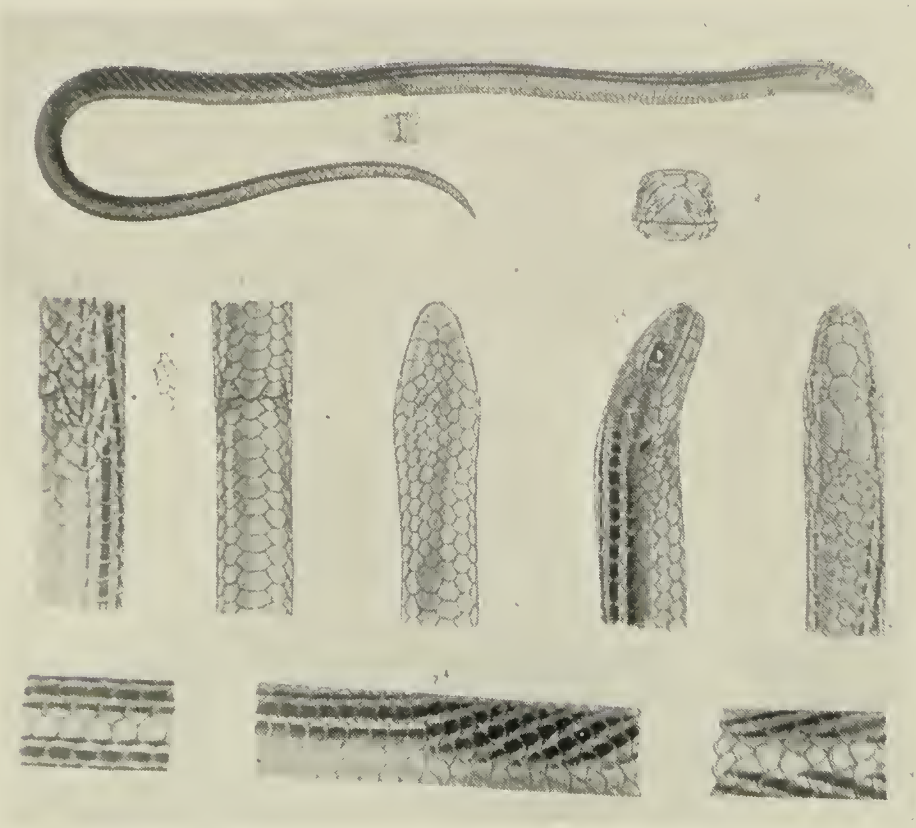
Cryptodelma nigriceps.

Of this species only a single young one has been recorded. It was about five inches long, flesh-coloured above, with the head black. It came from Nicol Bay in West Australia.

The Eastern Slow-Worm.

Cryptodelma orientalis.

Head rounded, snout not prominent. Ear exposed. Eighteen scales round the middle of the body. Brown above, with a darker line along each series of scales; back of the head yellowish, edged behind with a black band; below yellowish. Length 15 inches. New South Wales and Queensland.


McCoy Prod. Z.V.

Delma impar.

Fraser's Slow-Worm.

Delma fraseri.

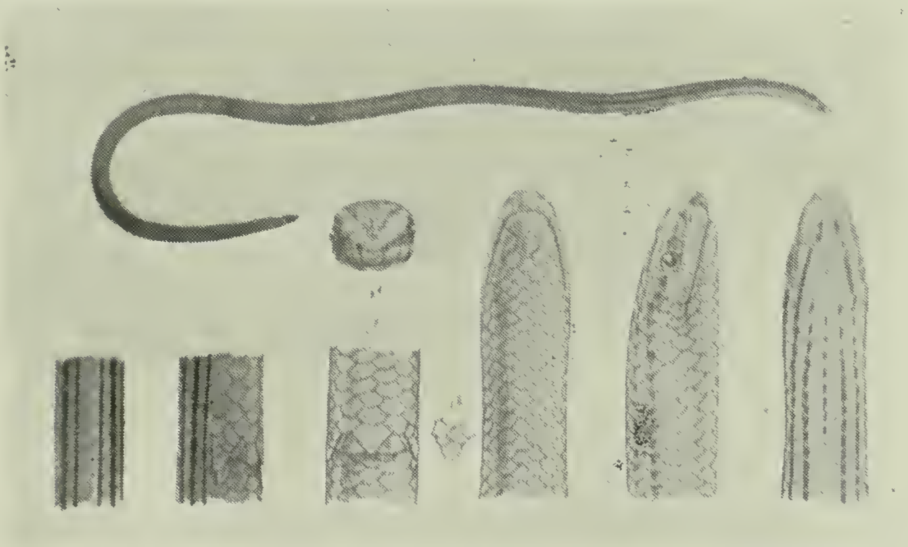
Head rounded, snout not prominent. Ear exposed. Sixteen scales round the middle of the body. The leg flaps are smaller than in *Pygopus.* Colour light greyish-brown above, uniform, or with black cross bands on the head and snout, and a number of fainter spots along the sides; below yellowish or light brown. Length to 18 inches. Probably all Australia except perhaps the North.

Mr. De Vis has described two forms of *Delma* from Queensland, which he regards as distinct from *D. fraseri.* In *D. tincta* there are only 12 rows of body scales, and the general colour is olive suffused with salmon-colour. In *D. plebeia* there are 14 or 16 rows of scales, and the colour olive, with dark reticulations.

The Striped Slow-Worm.

Delma impar.

Head narrow, bluntly rounded in front. Ear exposed. Fourteen or fifteen scales round the middle of the body. Colour greyish-olive above, top of the head dark brown; on each side alternating narrow light and dark lines which turn obliquely upwards and backwards over the tail. Length up to 12 inches. Probably all over Australia.



McCoy Prod. Z.V.

Aprasia pulchella.

It may be found coiled up like a snake under large stones, but is more often turned up by pick and shovel when surface soil is removed. It is the most beautifully marked of the Slow-Worms.

Of *Pletholax gracilis* little is known. It is described as pale brown in colour with a lighter band down the back. South-west Australia.

The Little Slow-Worm.

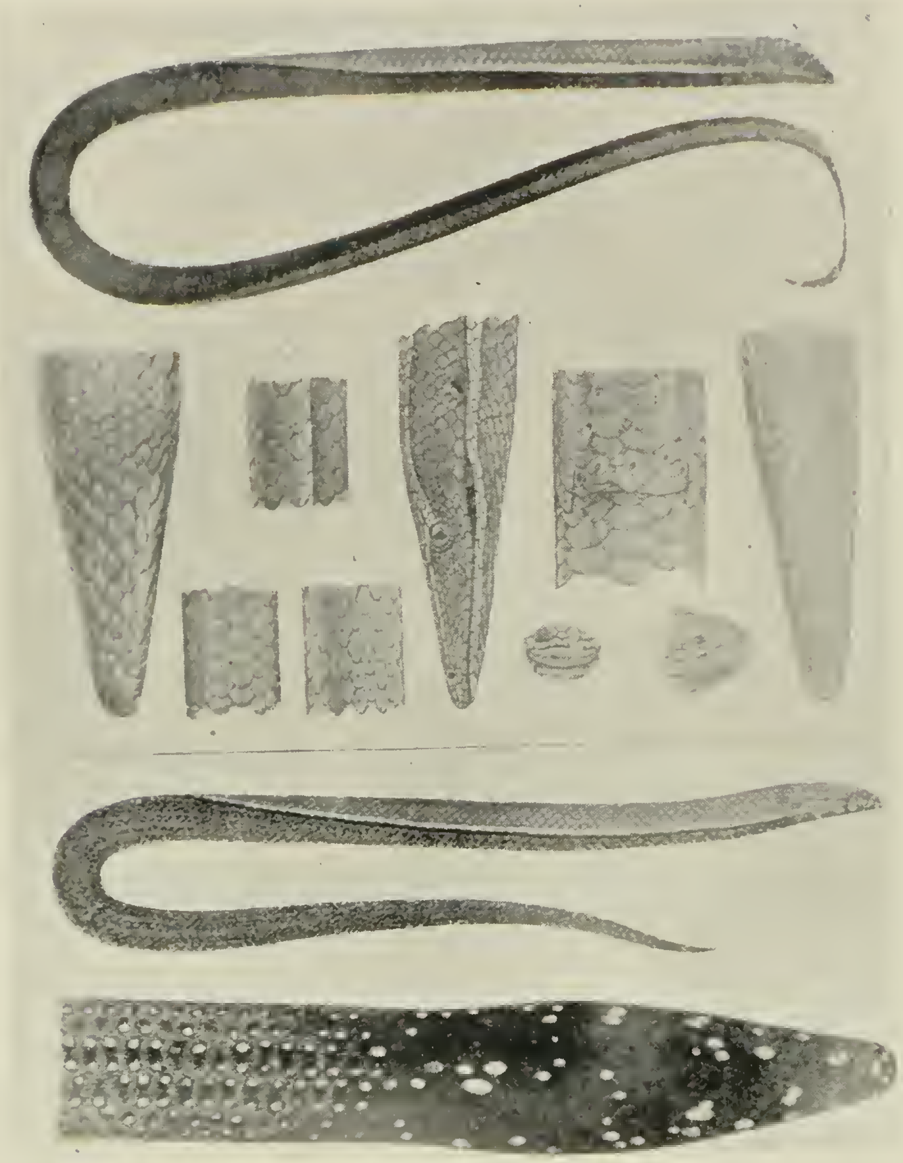
Aprasia pulchella.

Head very small, snout projecting beyond the lower jaw in front, so that the mouth is somewhat like that of a shark. Ear hidden. Twelve scales round the middle of the body. Colour brownish-yellow above, with six to nine longitudinal narrow dark-brown streaky lines on the back and tail, paler below. Length to 7 inches. Recorded from West Australia and Victoria.

The Desert Slow-Worm.

Ophidiocephalus taeniatus.

Snout very prominent, pointed. Ear hidden. Sixteen scales round the middle of the body. Colour uniformly cream-coloured above, lateral and ventral surfaces brownish-grey. Length 10½ inches. Central Australia.



Lialis burtonii. *McCoy Prod. Z.V.*

Burton's Slow-Worm.

Lialis burtonii.

Head long, pointed. Tongue bifid. Ear exposed. Nineteen or twenty-one scales round the middle of the body. Colour extremely variable, brown, grey, reddish or yellowish, uniform, or with a pattern of markings of which the most constant feature is a white band along the lips and extending along the side of the body. Length to over 20 inches. All over Australia, the Islands of Torres Strait, and New Guinea.

Like the other Slow-Worms, *Lialis* burrows in the ground. In Central Australia it is described as oviparous, "laying two eggs in late summer." From this record, and from the relationship with the Geckoes, it seems likely that all the members of the family are oviparous, but this remains to be proved by observation.

Family Agamidae.

Somewhat variable, but usually with large head, stout body, and a long, tapering and not fragile tail. Ornamental appendages such as crests, gular pouches, braids and frills, are often present, either in the males only or in both sexes. The tongue is thick and fleshy, and sometimes brightly coloured, yellow or blue. The eye is small, with a circular pupil, and is protected by well-developed upper and lower movable eyelids.

Both pairs of limbs are well developed, with usually the full complement of five digits, which are keeled or denticulated. The skin is rough, and covered with scales of which some are often conical or spinose. The head is not plated. The *Agamidae*, like the Geckoes, are oviparous. They are active animals, and hunt by day. Some of the species are very abundant.

No vernacular name has been applied to the members of this Family as a whole. Perhaps it will be convenient to call them Dragon Lizards, for in shape they, more than any of the other Lizards, recall the conventional Dragon, and certain of them have locally in Australia received such alarming names as the Blood-sucker, and even Alligator. Further the only existing Dragons, the flying species of *Draco*, found in the East Indies, are typical members of the Family.

Key to the Genera.

I. Mouth large. Teeth erect in both jaws.	
1. No præanal or femoral pores.	
A strong fold across the chest.	Gonyocephalus.
No fold across the chest.	Chelosania.
2. Præanal or femoral pores, at least in the males.	
Body depressed; tympanum distinct.	Amphibolurus.
Body depressed; tympanum hidden.	Tympanocryptis.
Body slightly depressed; tympanum distinct.	Diporophora.
Body compressed; no frill.	Physignathus.
Body slightly compressed; large frill round the neck.	Chlamydosaurus.
II. Mouth very small; teeth in the upper jaw horizontal, directed forwards; body covered with large spines.	Moloch.

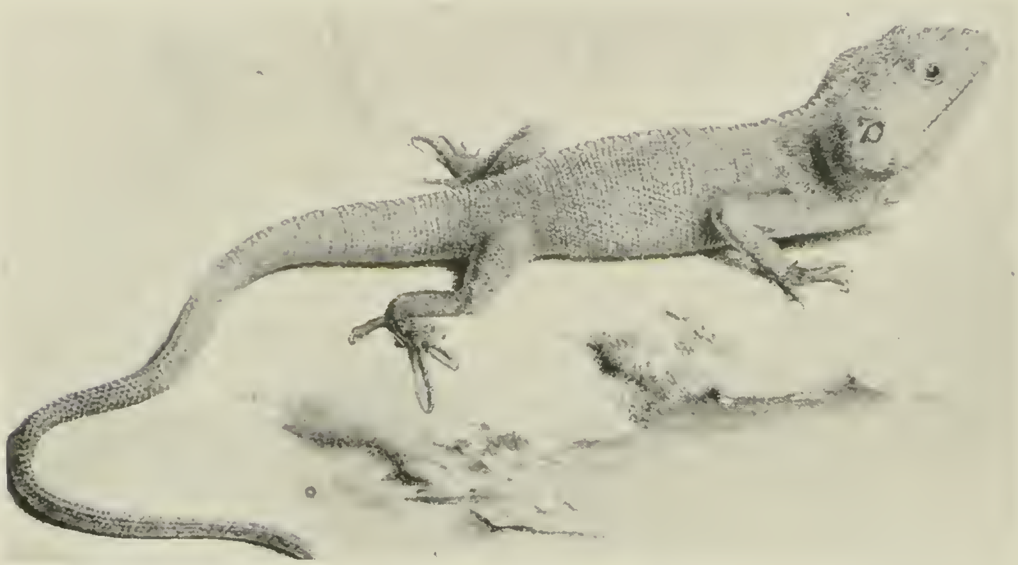
Genus Gonyocephalus.

Body compressed (deeper than broad). Ear exposed. A dorsal crest. From the Andamans to Fiji. North-east Australia.

The Spiny-footed Crested Dragon.

G. spinipes.

Limbs with enlarged spinose scales amidst unequal keeled scales. Brown above with indistinct darker spots, a white line on the back of the thigh. Length 15 inches. Queensland and adjacent parts of New South Wales.



Brit. Mus. Cat.

Chelosania brunnea.

The Great Crested Dragon.

G. godeffroyi.

Dorsal scales small, equal, keeled. Dark brown with more or less distinct yellowish cross bars. Length to 3 feet 6 inches. Bismarck Archipelago, Solomons, Fiji, North Queensland.

The Blue-checked Crested Dragon.

G. boydii.

Dorsal scales small, equal, keeled. Reddish-brown with dark cross-bands; sides of the head stone-blue; gular pouch and space between eye and ear yellow; below greyish-yellow. Length 18 inches. Herbert River, Queensland.

Genus Chelosania.

Body compressed. Ear exposed. A very feeble dorsal crest. Australia.

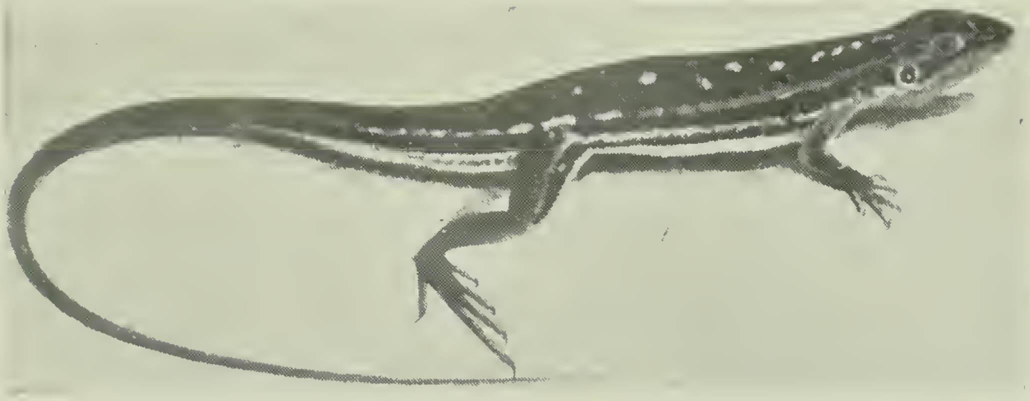
The Swelled-head Dragon.

C. brunnea.

Head large, swollen. Limbs rather short. Uniform pale brown. Length 10½ inches. West Australia.

Genus Amphibolurus.

The dominant genus of Australian Dragons, and confined to the continent. In the breeding season the colours and markings are often brilliant, and black or dark Λ-shaped marks or black patches appear on the throat and chest, especially in the males; at other times the colouring is much duller and reduced, and the markings are less conspicuous. They are mostly active Lizards, running about the ground in the full sunlight, but rapidly scrambling among the rocks or climbing among the shrubs if pursued.



Horn Exp.

Amphibolurus maculatus.
Male. Side view.

A.—The long-legged species. The hind limb stretched forwards reaches beyond the orbit.

The Military Dragon.

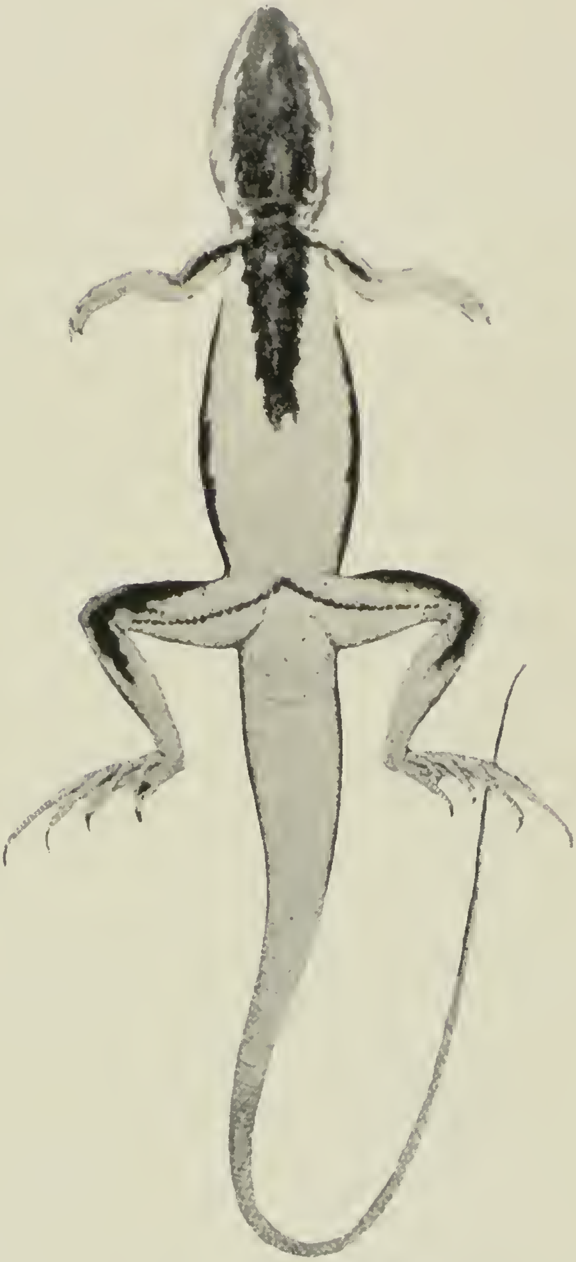
A. maculatus.

Fifty præanal and femoral pores. Colour bright brick-red above with black spots and yellow ocelli; yellow, red, white and black lines along the sides. Length of male 8 inches, of female 8½ inches. Found under logs in West and Central Australia.

Peters' Dragon.

A. imbricatus.

Thirty or forty pores. Colour yellowish-brown above with black spots and dots which are confluent on the sides of the neck and body into two or three longitudinal lines, and white spots confluent into transverse bands. Length 8 inches. Burrows in the sand, also found under stones, frequently seen about in the daytime. South and Central Australia.



Horn Exp.

Amphibolurus maculatus.
Male. Under surfaces, breeding season.

The Ornate Dragon.

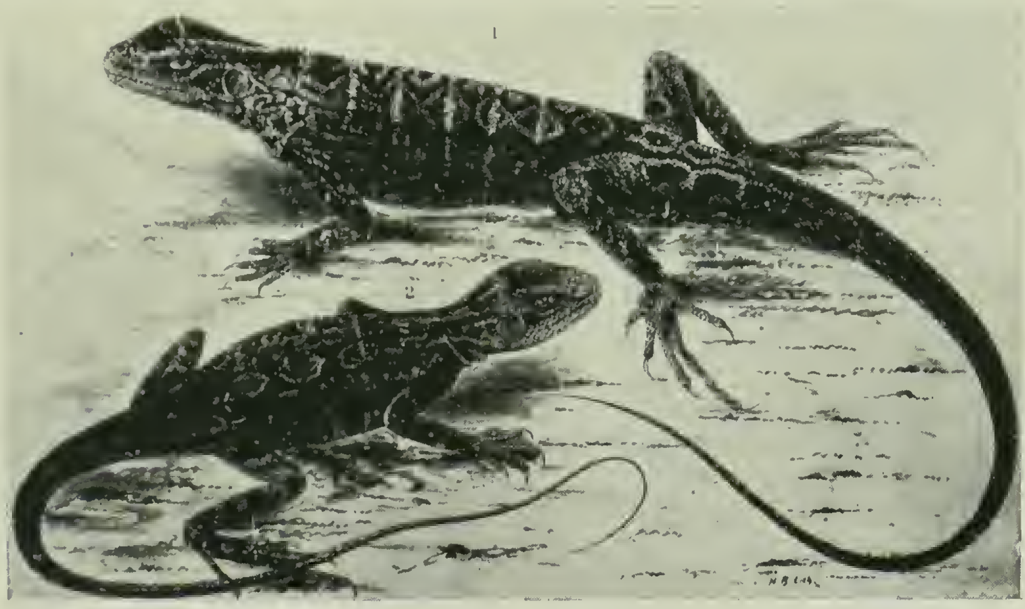
A. ornatus.

Sixty pores. Colour black above with a series of large irregular yellowish spots on the mid-line of the back, and smaller ones on the sides. Length 10 inches. West Australia.

The Rusty Dragon.

A. rufescens.

Sixty pores. Colour rusty-brown above with dark spots more or less in pairs along the mid-line. Length 9 inches. South Australia.



Proc. Roy. Soc., S.A.

Amphibolurus scutulatus.

The Low-crested Dragon.

A. cristatus.

Fifty pores. A nuchal crest of a few compressed spines. Colour dark olive above, with mottlings on head and neck. Length to 14 inches.

The Lozenge-spotted Dragon.

A. scutulatus.

Fifty pores. Above with a continuous lozenge-pattern in pale reddish-brown, with darker centres. Length of male 13 inches, of female 7 inches. West Australia.

The Ring-tailed Dragon.

A. caudicinctus.

Thirty-three pores. Pale brown above, tail with regular black rings. Length 8 inches. North-west Australia.

B.—Short-legged species. The hind limb stretched forwards does not reach beyond the orbit.

The Tawny Dragon.

A. decresii.

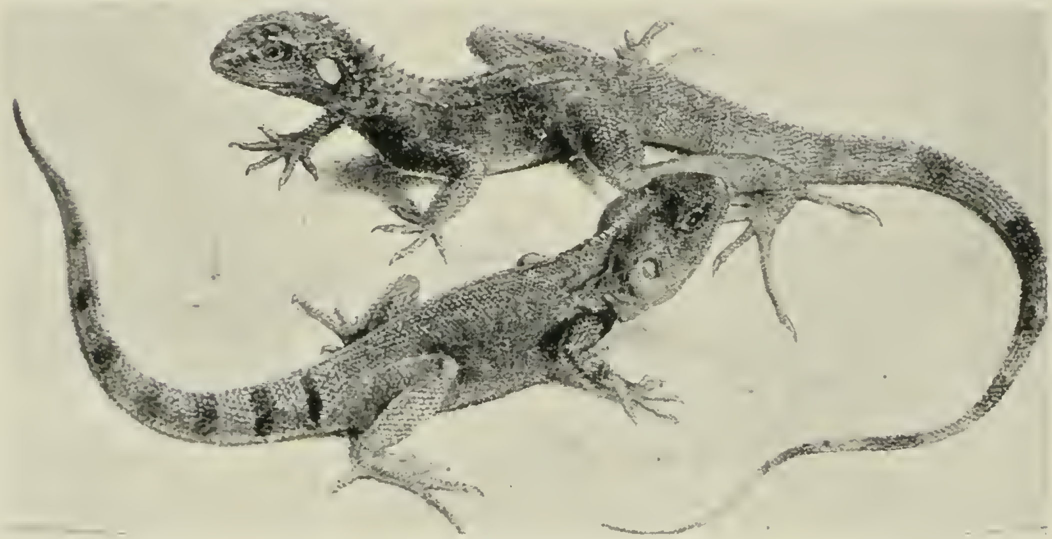
Fifty pores. Ventral scales smooth. Olive brown above, sides spotted or striped with tawny. Length 9 inches.

The Painted Dragon.

A. pictus.

Thirty or forty pores. Ventral scales smooth. Brick-red above, with blue stripe down the back, blue sides with yellow spots, and blue limbs and tail. Length 9 inches. Usually found under logs and stones. About eight eggs in the autumn. West, Central, and South Australia and Western Victoria.

Amphibolurus cristatus.



Brit. Mus. Cat.

A. caudicinctus.

The Netted Dragon.

A. reticulatus.

Pores from 14 to 33. Ventral scales smooth or perceptibly keeled. Yellowish above with a network of narrow black lines. Head yellow-olive to orange red with black markings. Female more rusty. Length of male 10½ inches, of female 7 inches. Six to eight eggs laid in the autumn. West and Central Australia.

The Smooth-backed Dragon.

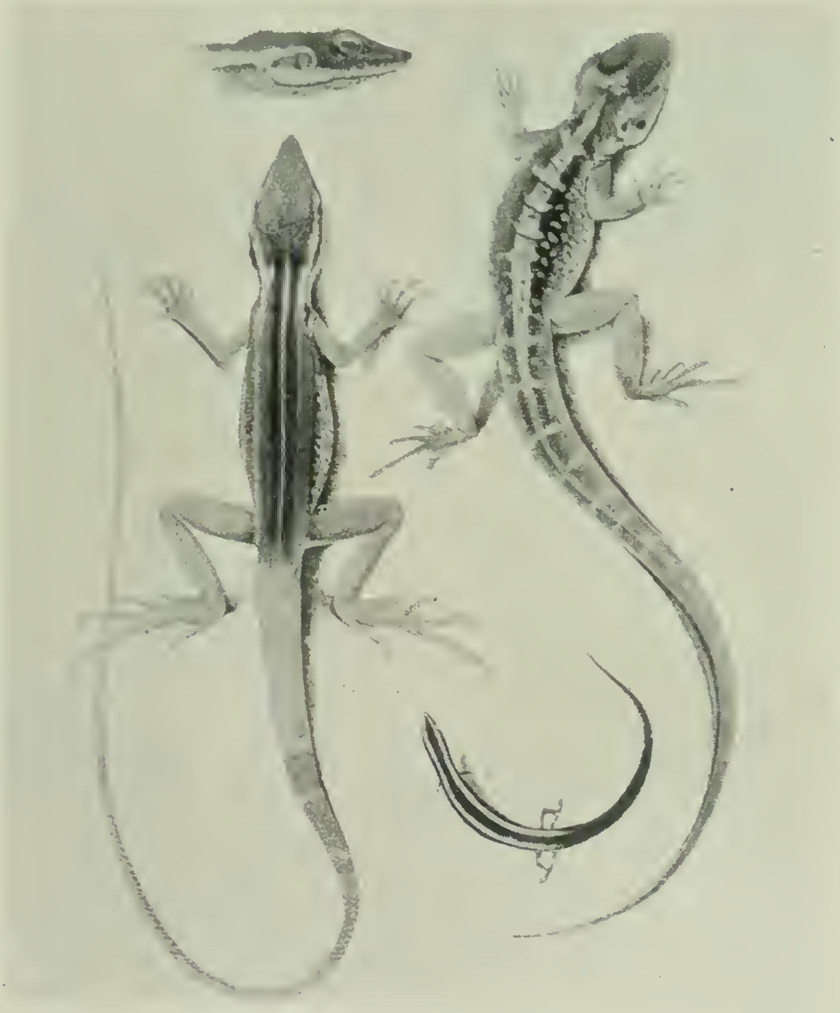
A. inermis.

Twenty pores. Dorsal scales smooth. Brown or pale yellow, densely reticulated with black or brown. Length 8 inches. Queensland.

Queen Adelaide's Dragon.

A. adelaidensis.

Twenty to thirty pores. Ventral scales keeled. Pale olive-grey above with two series of angular dark brown, white-edged spots on the back, and one on each side. Length 5 inches. West and South Australia, Victoria, Tasmania.



Horn Exp.

Amphibolurus pictus. Male.

Physignathus longirostris.

Ablepharus lineo-ocellatus, var-ruficaudus.

The Little Spotted Dragon.

A. pulcherrimus.

As in preceding. Four longitudinal rows of black spots on the back. Length 4 inches. West Australia.

The Mountain Dragon.

A. angulifer.

Pores from 12 to 22. Brown above, sides darker; a festooned dark brown, black edged band along the back. Length 8 inches. Tail not much longer than the body. New South Wales, Victoria, Tasmania. Met with among rocks in more elevated regions.

The Common Dragon.

A. muricatus.

Pores 10 or 12. A small vertebral crest or serrated ridge, with a parallel row of larger spines on each side of it. Tongue and mouth bright yellow. Tail twice as long as the body. Ashy to dark olive-brown above, with a lighter band on each side of the back. Length 12 inches. Australia except the Centre and North, Tasmania.

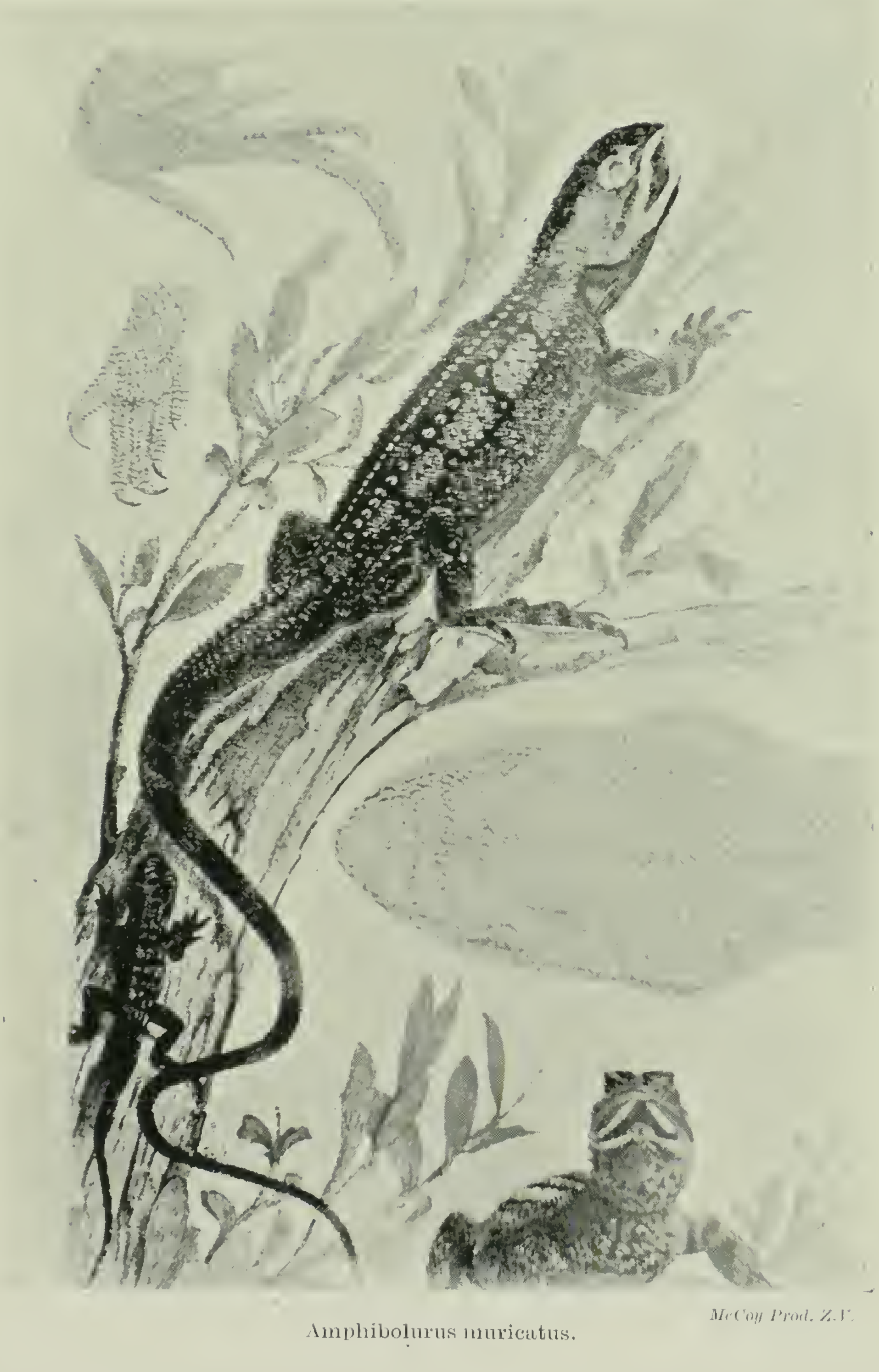
"This is the commonest Lizard about Melbourne, especially in the sandy districts on the south coast, where it may often be seen on a stump of Tea-tree, which it resembles in colours and marking so nearly that it is almost impossible to distinguish it unless the sun happens to glance from its bright eyes. It is fond of basking in the sun on sandy paths. In confinement it feeds readily on flies. The eggs, 4 to 8, are laid in the sand." (McCoy.) It is very common in the bush also about Sydney, and the Blue Mountains where it is found in company with the Mountain Dragon.

The Bearded Dragon or Jew Lizard.

A. barbatus.

Pores 12 to 16. Body stout and depressed, head large, a beard of long spines fringing the head behind the ears and the lower jaw. Legs short. Brownish grey above, with or without darker markings. Length up to 21 inches, by far the largest species. All Australia except perhaps the extreme North.

The Bearded Dragon is usually found on the ground or fallen trees, or on fences. When irritated, it raises its head, opens its mouth, and extends the frill, at the same time expanding its ribs so that the body assumes almost the form of a dish. It hisses like a snake. It will, if alarmed, bite savagely, but the result is rarely more than a hard pinch. While engaged on one occasion in putting out a bush fire, a Bearded Lizard came up to me, driven out by the flames. I placed him on my shoulder, and he remained



McCoy Prod. Z.V.

Amphibolurus muricatus.

there calmly watching the rest of the operations. He did not attempt to escape as I walked to my home. There I placed him on a gum-tree, which he climbed leisurely, and afterwards I saw no more of him.

The Bearded Lizard lays 12 or 14 eggs connected by membrane in a row.

Austr. Mus.

Amphibolurus barbatus.

Genus Tympanocryptis.

Tympanum concealed. Pores not more than four. Australia. Ground lizards found in holes or under stones.

The White-streaked Earless Dragon.

T. lineata.

Brownish above with five interrupted longitudinal white lines, three on the back and one on each side. Length 5 inches. West, South, and Central Australia and Victoria.

The Brown Earless Dragon.

T. cephalus.

Reddish-brown, without the white lines. Probably a variety of the preceding. West and Central Australia.

Genus Diporophora.

Tympanum distinct. Pores not more than four. Australia. Habits of the preceding.

Gray's Dragon.

D. bilineata.

No fold of the skin across the throat (gular). Tail between two and three times as long as the head and body. Sometimes with two or three light bands along the back. Length 10 inches. North and West Australia.

McCoy Prod. Z.V.

Tympanocryptis lineata.

The Blue-backed Dragon.

D. winneckei.

Slight gular fold. Tail between two and three times as long as the head and body. Brown with a blue vertebral and a white band along each side. Length 8 inches. Feeds on grasshoppers. Eggs three or four. Central Australia.

Steindachner's Dragon.

D. australis.

A gular fold. Tail twice as long as head and body. Length 10 inches. North Australia and Queensland.

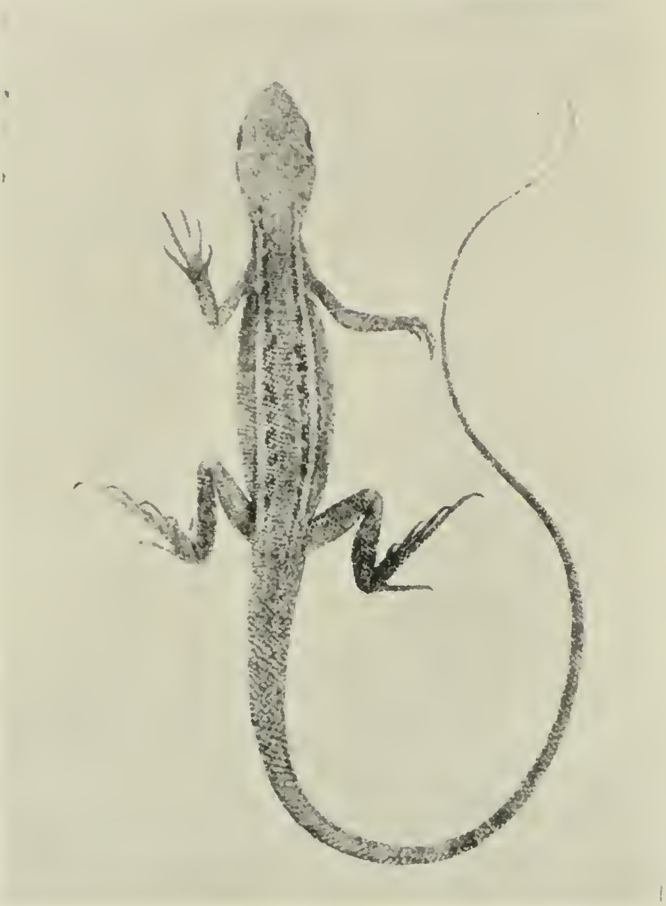
Bennett's Dragon.

D. bennettii.

A gular fold. Tail not much longer than head and body. Length 5 inches. North-west Australia.

Genus Physignathus.

Body compressed. Crests on the neck and back. A strong gular fold. East Indies and Australia.



Diporophora winneckei.

Gilbert's Water Dragon.

P. gilberti.

Tail round. Back with lines of keeled scales, the keels parallel to the mid-line; 8 to 14 pores. Olive-brown above, head and sides darker, a light band along the lips, another along each side of the back. Length 19 inches. West and North Australia.

P. longirostris and *P. temporalis* are very similar forms, but the dorsal scales have keels directed obliquely towards the mid-line of the back. The former, with a large snout, occurs in West and Central Australia, the latter at Port Essington in the North.

The Eastern Water Dragon.

P. lesueurii.

Tail strongly compressed. 16 to 22 pores. Dark olive above, with darker and lighter cross bands, most marked on the tail; a broad dark band from the eye over the ear to the shoulder. The cheek pouch is barred with lines of blue and yellow. Length to over 3 feet. Eastern Australia.

This is our most distinctly aquatic Lizard. It frequents the banks of rivers and creeks from Queensland to Gippsland, swimming with great ease. It is, in fact, as much at home in the water as on the land. In following the banks of the stream one frequently sees them sunning themselves on the rocks or busily occupied in cleverly capturing the insects on which they feed. The crop of one we shot on the banks of the Wellington River was simply crammed with the heads and stings, the indigestible relics, of dozens of the native bees. If disturbed they at once take a header into the water.

Genus Chlamydosaurus.

Neck with a large frill-like expansion of the skin on each side, confluent on the throat. West and North-west Australia and Queensland.

The Frilled Dragon or Frilled Lizard.

Chlamydosaurus kingii.

The only species, with the range of the genus. The most striking and original of all our Lizards, with its pointed angular snout, its wide frill, its slender body, and extremely long tail, the serrated back and tail, and its habit of running erect on the two long hind legs, with head erect and frill extended, for considerable distances. It is pale brown in colour, sometimes darker, uniformly coloured, or with patches of darker brown or black and of yellow. Full grown individuals may reach nearly three feet in length, and when alarmed will turn to bay, extend the frill to the utmost, and hiss loudly. They are then sufficiently uncanny and dragon-like in appearance, but are really not very terrible, and they make very interesting and docile pets.

Magnificent illustrations of this Lizard and of the Moloch are given in the late Mr. Saville-Kent's fine work *The Naturalist in Australia*. Mr. Kent states that when running the three central digits only rest upon the ground, and that their tracks must then be tridactyle like those of birds and the extinct Dinosaurs, which appear to have used a similar method of progression. He also states that the Frilled Lizard feeds chiefly on beetles.

Genus Moloch.

Characters and distribution of the single species.

Austr. Mus.

Frilled Lizard.

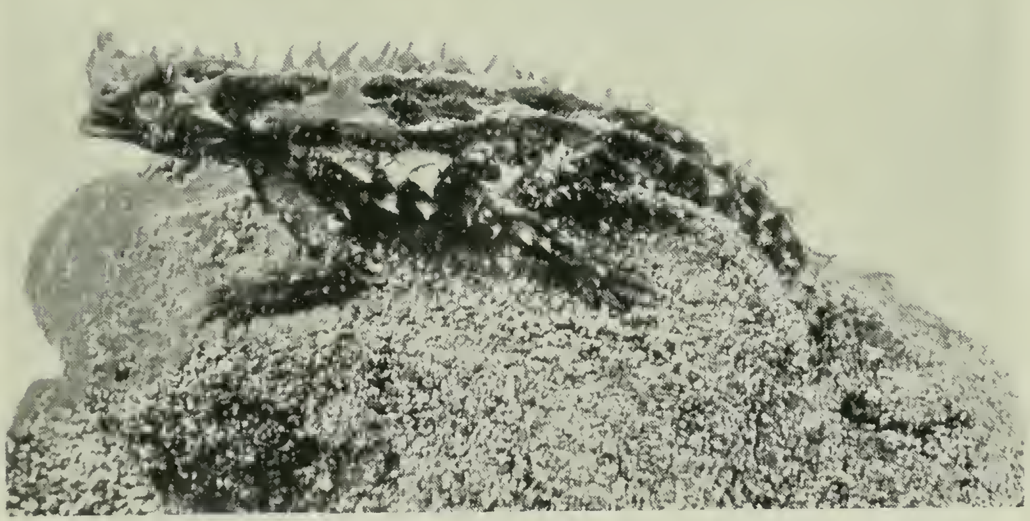
The Horned Dragon or Moloch.

Moloch horridus.

Head very small, with an extremely short snout and tiny mouth, and with a large horn over the eye, with another behind it, and other smaller ones behind the nostril, in front of the ear, and on the back of the head. On the neck a row of seven large spines, followed by a globular hump, and a pair of large spines pointing outwards and backwards. Rows of prickles down the back. The limbs strong, covered with polygonal scales and large spines; digits very short, armed with strong claws. Tail rather short, ending bluntly. Yellowish with large chestnut-brown darker-edged symmetrical markings. Length 8½ inches. West, South, and Central Australia.

Mr. Saville-Kent, who kept several of these little animals as pets, gives some very interesting details regarding their habits. He says that they feed on the smallest black malodorous ants.

He fed his pets by turning them loose by the roadside or on a garden path wherever the ants showed themselves in sufficient numbers, there being no great difficulty in finding these in Western Australia. "Liberated there, they would soon settle down to feeding in a row, and the number of ants an individual Lizard would assimilate was somewhat astonishing. On one occasion experimental reckoning elicited the fact that no less than from 1000 to 1500 ants were taken in successive order, at a single meal, each ant being separately picked up by a flash-like protrusion of the slender adhesive tongue." After such a meal the Lizard would sometimes take a little constitutional, walking about with the tail high in the air.



Austr. Mus.

Moloch horridus.

Mr. Kent also says that though if handled incautiously the spines will draw blood from the hand that seizes them, the Moloch is eminently a peaceful creature. It will give a slight hiss if alarmed. "In captivity the females deposit individually half-a-dozen or more whitish eggs. These are large in proportion to the Lizard's size, over half an inch in length, and invested by a tough leathery membrane." They probably lay their eggs at some little depth in the ground, and also hibernate in holes or burrows, for they are very susceptible to cold.

The "knapsack" fleshy excrescence on the neck is quite a unique feature among our Lizards. Possibly it serves as a reserve food-supply during hibernation, but this is a mere surmise, and it must be stated that Mr. Kent is not responsible for the suggestion.

Family Varanidae.

Large long-headed Lizards, with long bodies and tails, covered over with great numbers of juxtaposed small scales, of which those on the under surface are squarish and arranged in parallel cross rows. The head is covered with small polygonal scales. The eyelids are well developed, and the ear opening is distinct. The tongue is very long and slender, bifid like a snake's, and can be withdrawn into a sheath at the base. The limbs are strong, with long claws on the toes. The tail is not fragile. Oviparous. The Monitors form a perfectly isolated group of Lizards, comprised in the single genus, and distributed over Africa, Southern Asia, and Australia. It is worthy of note that the pineal eye is less degenerate in the Varanids than in the other Lizards.

A.—Nostril round or oval; tail compressed, keeled above.

1. A transversely dilated median series of supraocular scales.

Varanus salvator.

Scales of the belly in about 90 rows, keeled. Blackish above with yellow spots, a black and a yellow band over the temple, yellow below. Length 7 or 8 feet. East Indies to Cape York.

V. indicus.

Scales of the belly in about 100 rows, smooth. Blackish above, dotted all over with yellow, yellowish below. Length 4½ feet. Celebes to North Australia and the Solomons.

2. Supraocular scales sub-equal.

The Lace Monitor or "Iguana."

V. varius.

Scales of the belly in about 125 rows, feebly keeled. Black above with small yellow spots arranged in cross lines over the neck and back; limbs with large yellow blotches; below greenish-yellow with black cross bands; hinder half of tail with alternate black and yellow rings. Length to 6 feet. Eastern Australia.

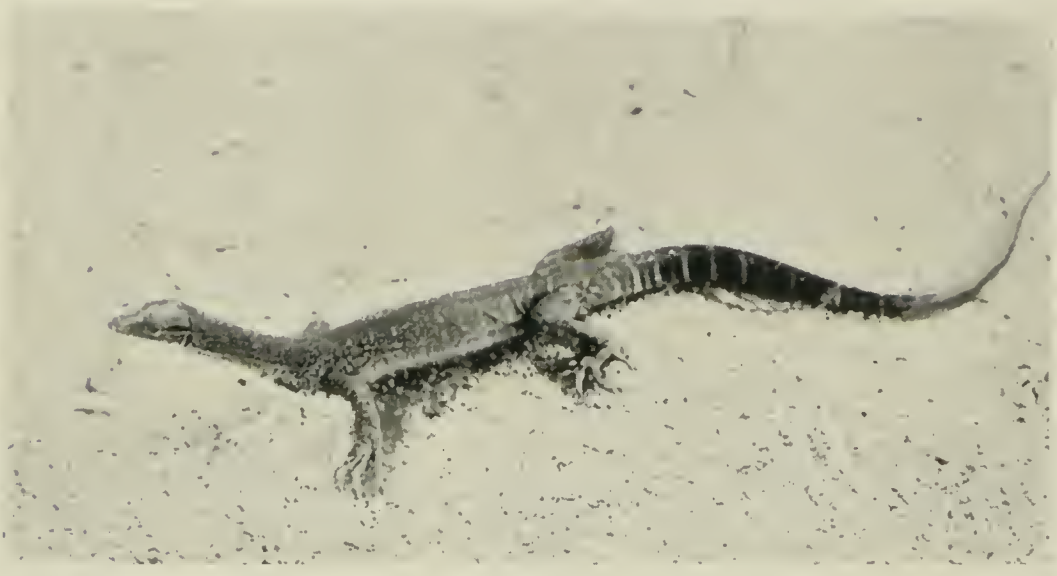
In Bell's variety the black colour of the body is divided by broad cross-bands of yellow.

The "Iguana," or "Goana," as it is sometimes called, is the most generally known Lizard in the older States. It is emphatically a tree Lizard, climbing the giants of the forest with ease, usually, if watched, in a corkscrew fashion. Its motive is usually to rob the nests of the birds of the eggs and young. If the parent birds are not at home, well and good, the Monitor obtains its meal. But one of the most interesting sights of the bush is that of the old birds defending their progeny against the marauder. With Cockatoos the Monitor has little chance, for they buffet him with their wings and dig at him

From life. *A. R. McCulloch.*

Varanus varius.

with their strong beaks, until he is glad to beat a hasty and undignified retreat. The nesting season is, however, limited, and the Monitor then will come to the ground, along which it runs as easily as on the trees. It is a voracious beast, and will feed on any animal, alive or dead, which comes in its way. The squatters approve of its appetite for rabbits, but are occasionally surprised to find partial joints of mutton in unusually distended individuals, no doubt taken from carcases of dead sheep. They are a nuisance to the poultry yards of the settlers, insinuating themselves cunningly into the sheds, and devouring many an egg and chicken. They are indeed accomplished robbers, climbing, crawling, running, and swimming with great skill. If captured, one will bite severely with its sharp teeth, so that it is not to be handled incautiously. The eggs are about a dozen in number, tough, white, and flexible, 2½ inches long by 1½ inches wide, that is, about the size of the egg of the Pied Cormorant, and are deposited in holes in the ground, hollow logs, &c.



From life.

Varanus varius.

V. *giganteus.*

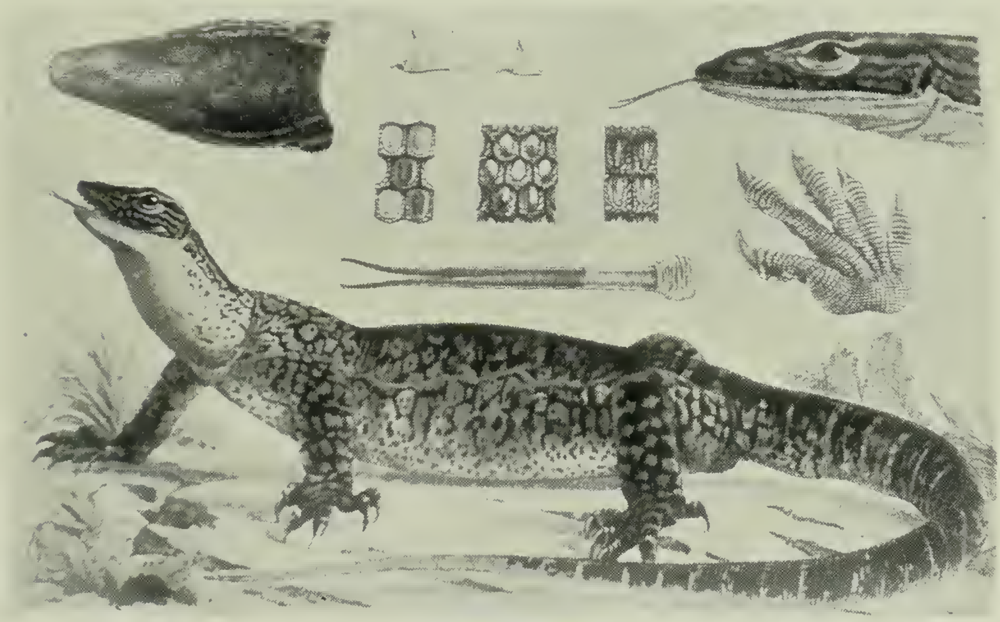
Scales of the belly in about 150 rows, smooth. Above blackish with cross rows of large light round spots, smaller spots on the limbs. Length 7 feet. North Australia. Habits of V. *varius.*

Gould's Monitor.

V. gouldii.

Scales of the belly in about 130 rows, smooth. Above brown, with rows of irregular pale yellow spots across the back and limbs, and narrow yellow lines across the tail; yellow streaks along the temples. Length to a little over 4 feet. All over Australia.

Gould's Monitor is much lighter coloured than the Lace Lizard. It does not take to the trees, but lives on the ground, hiding in holes, and is found commonly in waterless districts. When kept in confinement it hisses loudly if much vexed, but at other times gives out a gentle snuffling sort of cough. As in the other Monitors, the skin is thrown into wrinkles along the sides when the animal is at rest, but when excited, the whole skin is inflated and the wrinkles disappear. It is much less vicious than the Lace Lizard, and does not attempt to bite if gently handled.



Varanus gouldii. *McCoy Prod. Z.V.*

B.—Nostril round; tail round.

V. punctatus.

Scales of the belly in about 90 rows, smooth. Male with a tuft of spines on each side of the base of the tail. Olive above with narrow black lines inclosing large hexagonal spots; tail nearly uniformly black. Length 2½ feet. West, Central, and North Australia.

V. *timorensis.*

Scales of the belly in about 70 rows, smooth. Male without tufts of spines. Above blackish with yellow dots; a black temporal streak; tail with black rings. Length 2½ feet. North Australia.

V. *acanthurus.*

Scales of belly in about 70 rows, smooth. Blackish with large yellow rings; limbs and tail yellow-spotted; a black and yellow temporal streak. Caudal scales strongly keeled. Length 2¼ feet. North, Central, and West Australia. Found under stones and logs, burrowing in suitable places.

V. *caudolineatus.*

Scales of the belly in about 70 rows, smooth. Yellowish-grey above, with round dark spots; a dark brown temporal streak; tail with four longitudinal dark brown streaks. Length 8 inches. North-west Australia.

V. *gilleni.*

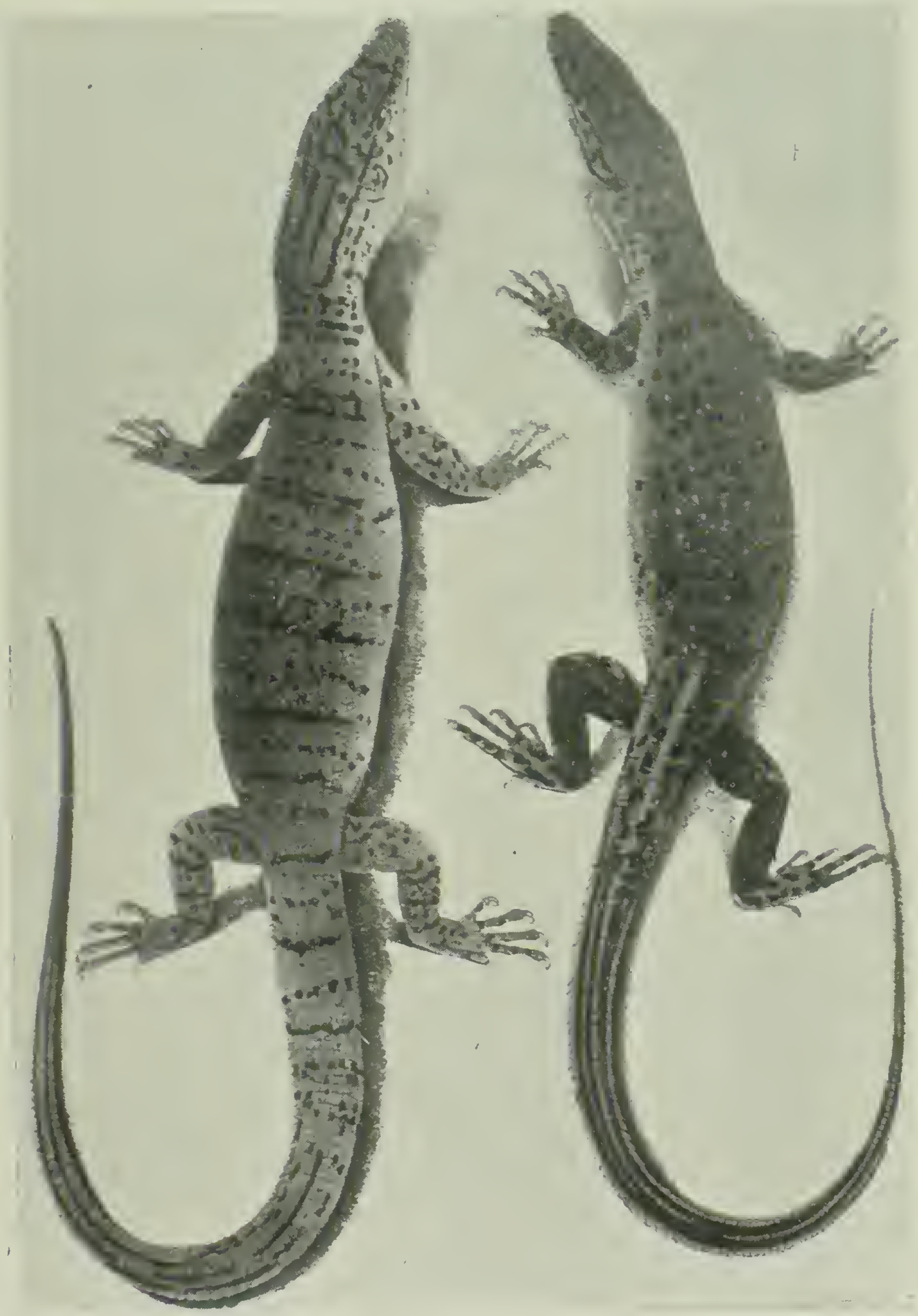
Scales of the belly in about 90 rows, smooth. Light brown above, with dark brown longitudinal lines on the head and distal part of the tail and cross lines of dull red spots over the back and the distal part of the tail and the limbs; below cream-coloured. Length 14 inches. Arboreal. Central Australia.

V. *eremius.*

Scales of the belly in about 70 rows, smooth. Rusty-brown above, with small lighter and darker spots. Tail grayish, with four (six in front) longitudinal black bands. Length 16 inches. Found on the ground under logs and débris. Central Australia.

Family Scincidae.

The Skink Lizards have rather flattened heads, rounded bodies, and usually long cylindrical tails, which are somewhat fragile, and if lost are slowly reproduced. The eye is moderately large, the pupil round, the eyelids well-developed and movable (except in *Ablepharus*), the lower scaly all over or with a transparent disc or window in the centre. The tympanum is usually more or less exposed. The tongue is moderately long, free, and feebly nicked in front, and is covered with scale-like papillæ. The limbs may be fully developed and pentadactyle, or may be quite rudimentary. The head is covered with symmetrical shields, the rest of the body with smooth or keeled overlapping scales, those on the back usually the largest, those on the sides smallest. There are no femoral pores. Oviparous or viviparous, the eggs oval with a flexible membranous shell.



Varanus gilleni. V. eremius. *Horn Exp.*

The Skinks are cosmopolitan, but the bulk of them occur in Australia.

The shields of the head in the Skinks are symmetrically disposed, on a pattern which is generally maintained throughout the family. Since the slight modifications in this pattern are made use of in the distinction of the sub-genera and species it will be convenient to give the terms employed.

Each lip is bordered by a single row of scales, the *labials* with a large scale in front; that of the upper lip is called the *rostral*, that of the lower lip the *mental*. On the upper surface of the head a single scale, the *fronto-nasal*, is in contact with the rostral, followed by the *frontal*, which reaches back to the level of the summit of the orbit. A pair of *pre-frontals* fill up the angle between the fronto-nasal and the frontal, and sometimes meet so as to separate these two scales. After the frontal come a pair of *fronto-parietals*, and the back of the head is covered by a pair of *parietals*, with or without an unpaired *interparietal* between and rather in front of them. Behind the parietals are the *nuchals* of the neck, which are intermediate in size between the head shields and regular scales of the back. The nostril is usually pierced in a small *nasal* scale, and, rarely, above this is a small *supra-nasal*. A row of small *supraciliaries* bounds the orbit, and above this, and in contact with the frontal and the fronto-parietals is a row of large *supraoculars*. The *temporals* lie between the orbit and the parietals.

Key to the Genera.

A. Tympanum, if distinct, deeply sunk below the surface.	
(*a*) Palatine bones separated on the median line of the palate.	
Mostly large rough lizards with keeled or spinous scales.	Egernia.
(*b*) Palatine bones in contact on the median line of the palate.	
1. Movable eyelids present.	
Large lizard with very large rugged scales on the back, a stumpy tail, and short legs.	Trachysaurus
Large blue-tongued lizards with smooth scales, long tails, and short legs.	Tiliqua.
Large smooth-scaled lizard, with an enormous crushing tooth on each side of each jaw.	Hemisphæriodon.
With two or three exceptions small lizards with smooth scales. Includes the greater number of the Australian skinks.	Lygosoma.
2. No movable eyelid, a transparent disc covering the eye.	Ablepharus.
B. Tympanum superficial and exposed.	Tropidophorus.

Lack of space will not allow us to give complete diagnostic descriptions of the Australian Skinks, for these number over one hundred species. Most of them are small forms, and but rarely met with, and are only of much interest to the specialist. We shall accordingly select only the more striking forms for description.

Austr. Mus.

Egernia stokesii.

Genus Egernia.

Of this genus, which is strictly Australian, eleven species have been described. Of these there are two groups, one including *E. stokesii* and *E. depressa*, which have remarkable and very flat spiny tails, which are much shorter than the body, and the other the remaining species, in which the tail is cylindrical, or nearly so, and is longer than the body.

E. stokesii is found in the West and the Centre. It is about 11 inches long. It is found on open stony plains. *E. depressa* is confined apparently to the West. It is smaller, not much over six inches in length, and has a similar habitat to *E. stokesii*. It is rather more prickly than that Lizard, thus the scales on the tail have three cusps in place of one.

E. whitii is an exceptionally smooth *Egernia*. It is also the best known, since it is found in numbers all over the Continent.

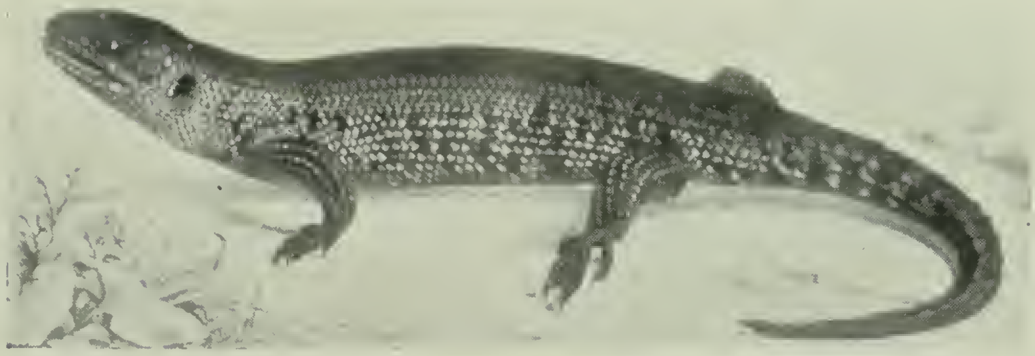
Austr. Mus.

Egernia kingii.

It may reach a foot in length, but is not usually so large. Typically it is beautifully coloured, the back presenting a median line of olive brown, having on each side of it a broad black band bearing a series of white or yellowish spots, and along the union of the back and each side a long white or light coloured band. The edge of the eyelids and the ear-lobules are constantly white. The rest of the pattern is not constant, and may be greatly modified. Thus in some individuals collected in Central Australia the back was uniformly of a bright brick-red.

It is a ground form, found in burrows or retreating under logs or stones.

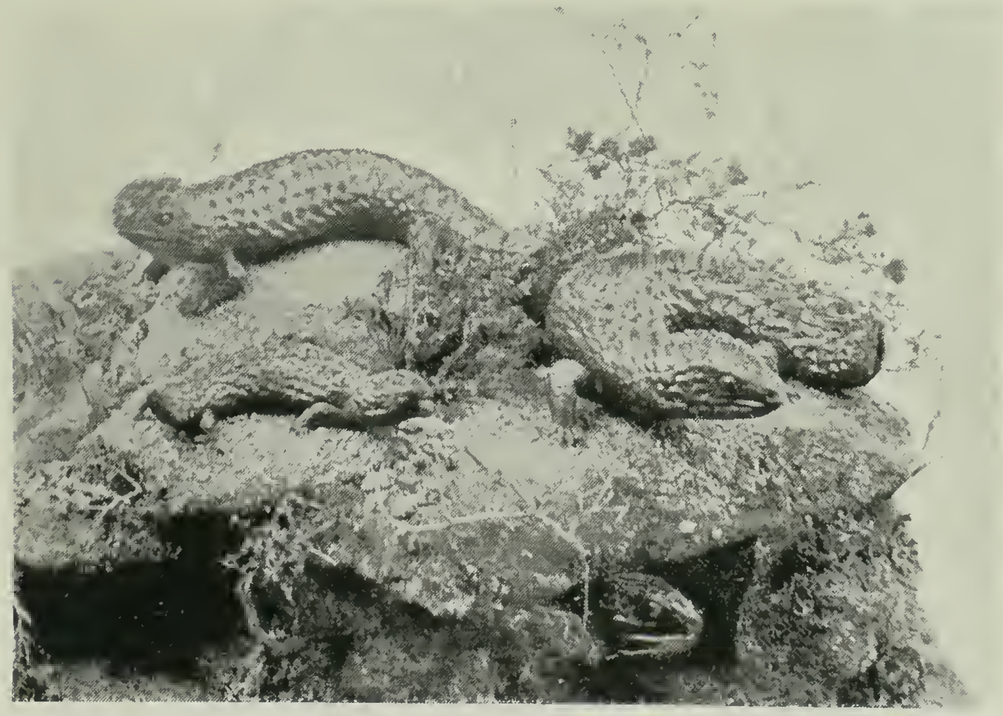
The long-tailed rough forms are mostly dark-brown in colour, without much variation, the under surfaces yellowish.



McCoy Prod. Z.V.

Egernia cunninghami.

The largest are *E. major* from Queensland, and *E. kingii* from West Australia, each reaching 19 inches. The commonest form about Melbourne and Sydney is the prickliest, *E. cunninghamii,* a little over a foot in length.



Austr. Mus.

Trachysaurus rugosus.

Genus Trachysaurus.

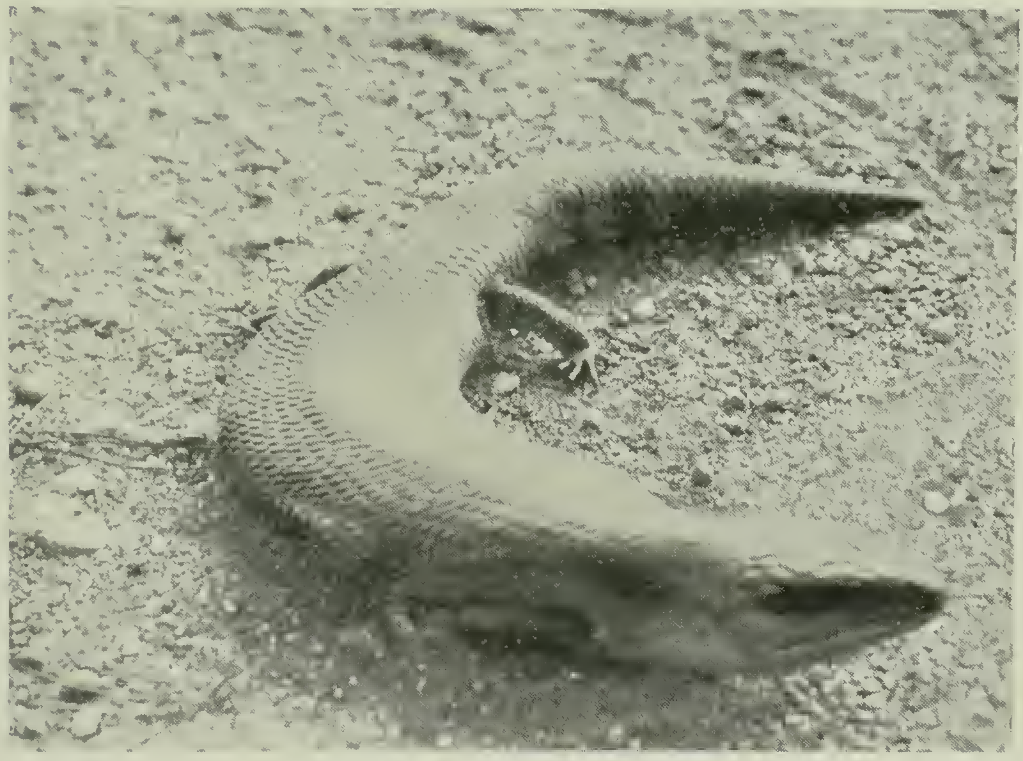
The Shingle-back or Stump-tailed Lizard, *T. rugosus*, is the only species. It has a wide range, though not recorded from the Centre or extreme North, nor from Tasmania. The head is short, thick, and blunt, the body long and thick, and the tail very short, broad, and flattened. The limbs are very short, and the animal is so lethargic in its movements that it is known in places as the Sleeping Lizard. The colour of the upper surfaces is a rich vandyke brown, uniform or variegated with yellow, of the lower surfaces yellowish, blotched or mottled with brown. The tongue is blackish-purple. Length 14 inches. Sluggish, as it is, the Shingle-back has a great reputation as an inveterate enemy of snakes, the grip of the jaws holding the snake tenaciously. McCoy showed that the single young is brought forth alive, being as much as 5 inches long at birth.

From life. Tiliqua scincoides.

Genus Tiliqua.

Five species of Blue-tongued Lizards are known from Australia, while the other species is found in Java, the Moluccas, and New Guinea. They are all large lizards with large heads, long bodies and tails, and short legs. The scales are moderately large and smooth. They are met with on the ground, and are usually easily captured, though on a hot sunny day, if warned in time, one must run very quickly to overtake them before they reach cover. They live easily in captivity, and will lap milk from a saucer with the prussian-blue tongue just as does a cat. Like so many of the lizards they are liable to be infested with ticks, especially about the ear opening.

T. scincoides is the largest species, extending nearly to two feet in length, while *T. adelaidensis* is the smallest, only 5 inches long, if indeed this is not a young form of one of the larger kinds. *T. scincoides* may be recognized by the anterior temporal scales being larger than the others; it is yellowish or pale brown above with dark brown cross bands, and a dark brown band from the temple over the neck. It extends from Tasmania to North Queensland. It is very sluggish.



From life. Tiliqua scincoides (Blue-tongued Lizard).

T. nigrolutea is a southern form, occurring in Tasmania, Victoria, and as far as the Blue Mountains of New South Wales. It runs to 15 inches in length, and is typically more contrasted in its colours than the other species. The head is olive-brown, the body dull yellow with black or brown dashes and cross bands, which leave the ground colour in five to seven irregular patches, tail with dark brown or black bands. It is much more active than *T. scincoides.* When irritated, it opens its mouth, and snaps from side to side, at the same time emitting a sound similar to that made by blowing with a bellows. If allowed to seize one's hand it holds on like a bull-dog. Its food consists of insects, fungi, and fleshy-leaved vegetation. In confinement it will feed on bread and milk and bits of raw meat. Curiously enough *T. scincoides* appears to be oviparous, while the young of *T. nigrolutea* are brought forth alive, in each case the number of young being 6 to 15.

T. occipitalis does not come further east than Western Victoria. It is coloured much as *T. scincoides*, but in this as in *T. nigrolutea*, the temporal scales are all about equal. *T. longicauda*, from Queensland, has a tail longer than the head and body.

From life. *C. Frost.*

Tiliqua nigrolutea.

Genus Hemisphaeriodon.

This includes a single Lizard, *H. gerrardii*, found in New South Wales and Queensland. It can be at once recognized by the great crushing teeth, one on each side of either jaw. Length 15 inches. Yellowish or pale brown, with eight dark cross bands, a ⊥ shaped brown mark on the chin, and another, ⌶ shaped, on the chin.

Genus Lygosoma.

Eyelids well developed. The ear hidden or deeply sunk. The genus is a very large one, cosmopolitan in distribution, and includes lizards with fully developed limbs, and others in which the limbs have become quite rudimentary or absent.

Key to the Sub-Genera.

A. Limbs well developed, pentadactyle.	
Lower eyelid scaly, no supranasals.	Hinulia.
Lower eyelid with transparent disc, no supranasals.	Liolepisma.
Lower eyelid with transparent disc, supranasals.	Emoa.
B. Limbs short or rudimentary.	
Prefrontals large.	
Supranasals present.	Riopa.
Supranasals absent. Lower eyelid scaly.	Homolepida.
Lower eyelid with disc.	Hemiergis.
Prefrontals small or absent.	
Frontal not broader than the supraocular border.	Siaphos.
Frontal broader than the supraocular border.	
Lower eyelid scaly.	Lygosoma. (restricted.)
Lower eyelid with disc.	Rhodona.

From life. Lygosoma (Hinulia) tæniolatum.

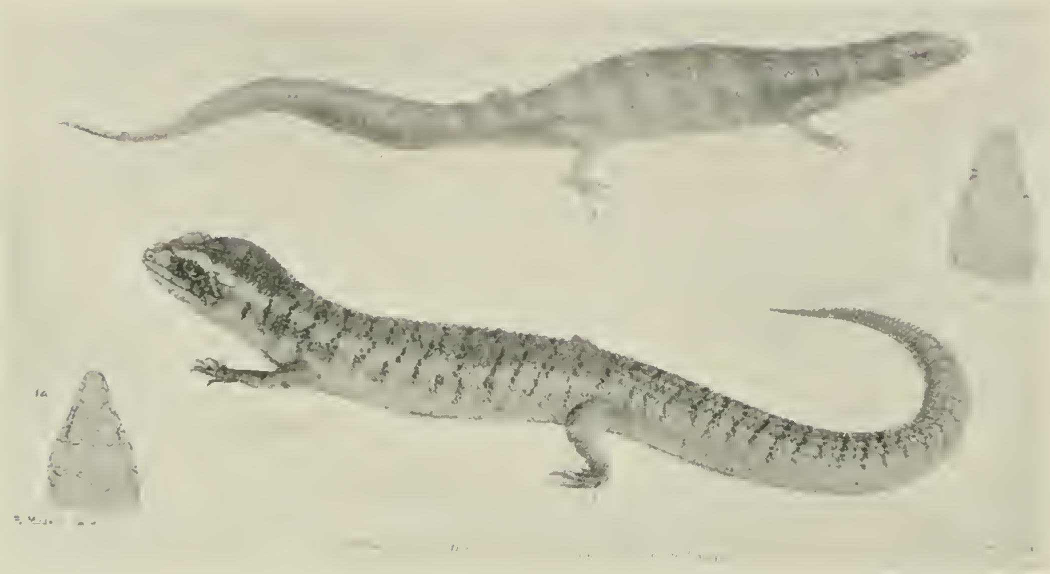
Sub-genus Hinulia.

Fairly large lizards, 7 to 11 inches in length, which feed in the daytime, running about actively, and consuming untold numbers of insects. Like the other forms of *Lygosoma* they are burnished with metallic lustre, and are brilliant objects, with their bright eyes and shining coats of armour, when seen basking in the sun, or darting on their prey. They occur in countless numbers, and are beautiful creatures, which we may thankfully believe will not be seriously affected by the advance of civilization.

H. lesueurii is one of the handsomest. In its typical colouring, the back is brown or olive, with a black white-edged vertebral band, and a white black-edged dorso-lateral band; the sides blackish with a regular series of white spots; below it is white. Length 11 inches. All over Australia.

H. taeniolata is another beautiful lizard, conspicuous from the numerous white and black bands along the back and sides. One may usually count eleven of these bands. It is slenderer in form than *H. lesueurii*, and has a similarly wide range. Length about 9 inches.

H. quoyi is a very common form in the South-east. It reaches nearly a foot in length, and is olive brown above with small scattered black spots; the sides are black with small whitish spots. It readily swims if disturbed on the banks of a stream. *H. tenuis* replaces *H. quoyi* to the North. It is much like it but the lips are constantly spotted with black, and the ground colour is greyer.



Brit. Mus. Cat.

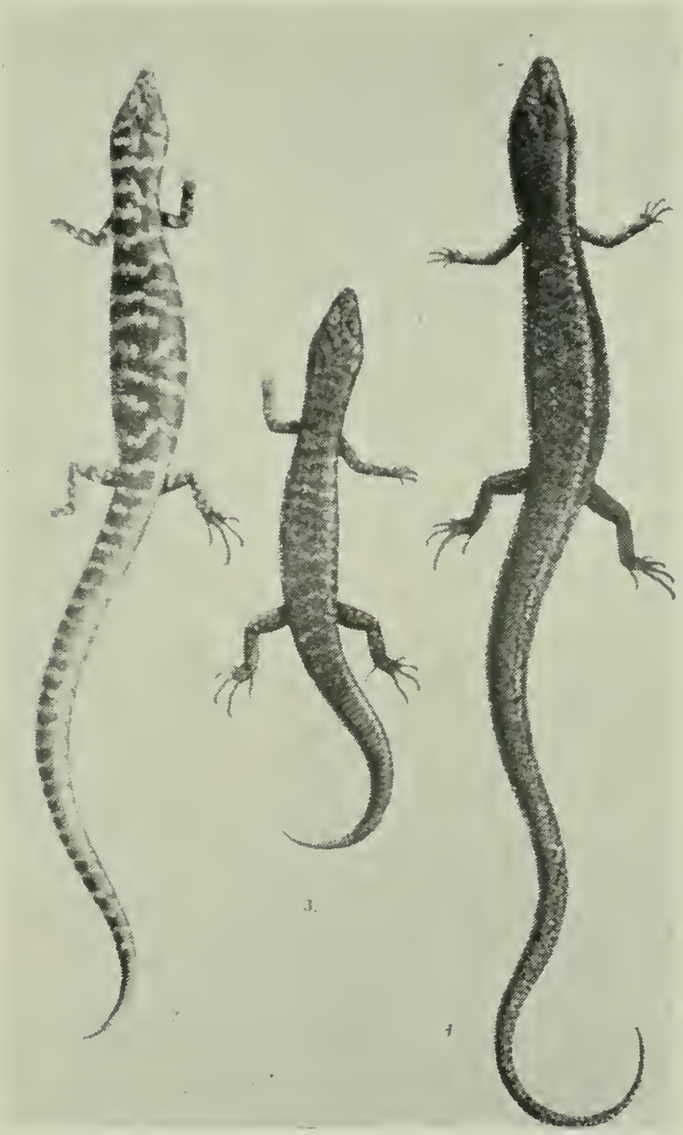
Lygosoma (Hinulia.)
1. fasciolatum. 2. monotropis.

H. richardsoni, *H. fasciolatum*, and *H. monotropis* have broad dark brown crossbands over the body.

Sub-genus Liolepisma.

This includes a great number of small metallic coloured lizards, with all manner of purple, green, and rich brown tints.

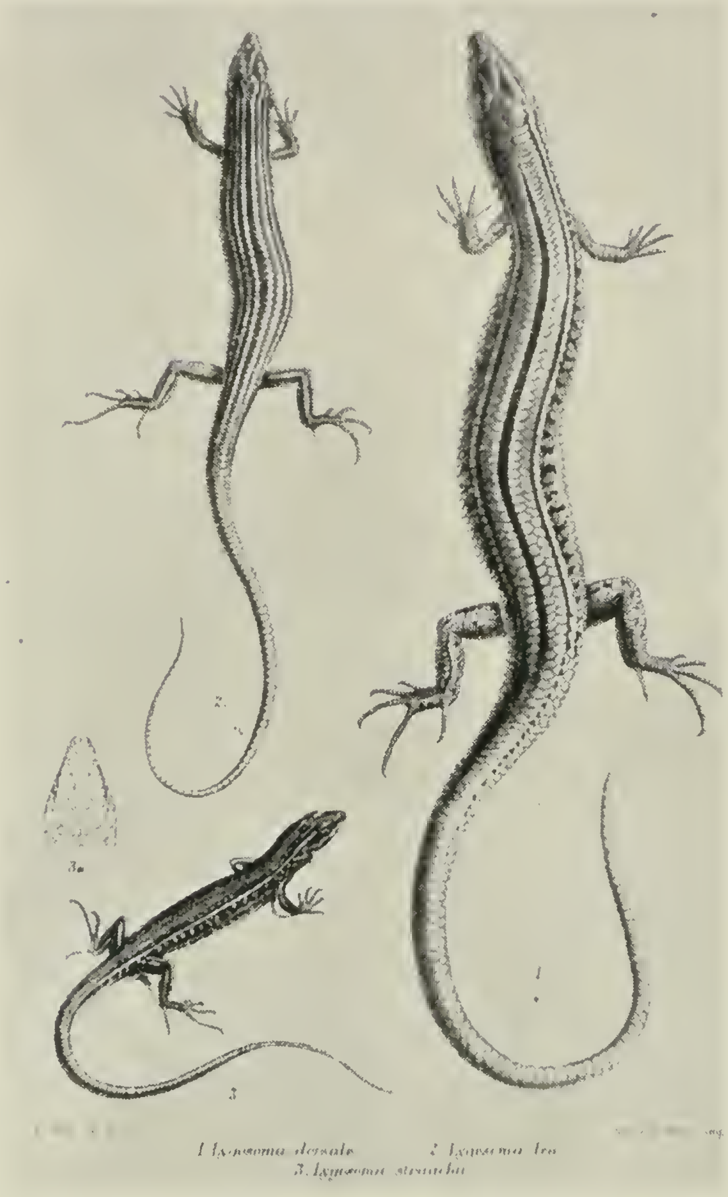
The lower eyelids when drawn over the eye still allows the lizard to view the outside world through a little window provided by the transparent disc. They are beautiful little creatures, and quite friendly in their disposition. Quite often if you camp for a midday meal in the bush the lizards will trustfully climb on to your knee, if you remain quiet, and will pick up any crumbs you may leave for them. You may carry them along with you perched on your hat or shoulder.



Brit. Mus. Cat.

Lygosoma (Hinulia.)
1. isolepis. 2. fasciatum. 3. rufum.

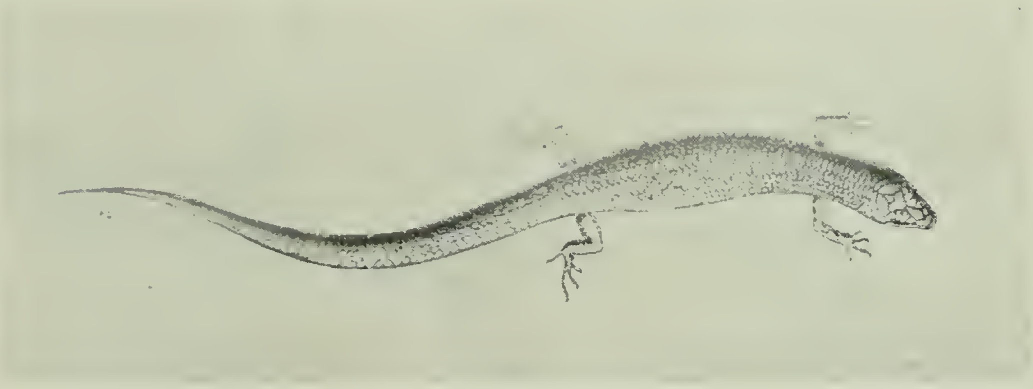
One of the prettiest is *L. mustelinum*, with its short insinuating head, slender body, and tail twice as long as the head and body together. It is pale or yellowish brown above with golden sides and tail, the dorsal scales delicately striated with brown, a white brown-edged streak below and behind the eye. It is a Southern form, and is usually about 5 inches long.



Brit. Mus. Cat.

Lygosoma (Hinulia.)
1. dorsale. 2. leæ. 3. strauchii.

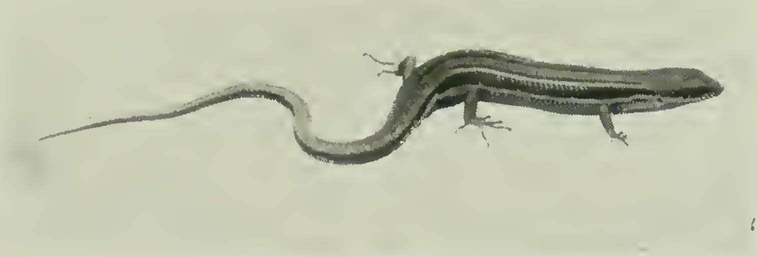
L. entrecasteauxii and *L. trilineatum* are distinguished by three black bands along the back dividing up the bronzy greenish-olive ground colour. In the former, a southern form, the parietals are distinct, in the latter, which is more generally distributed, they are united.



Brit. Mus. Cat.

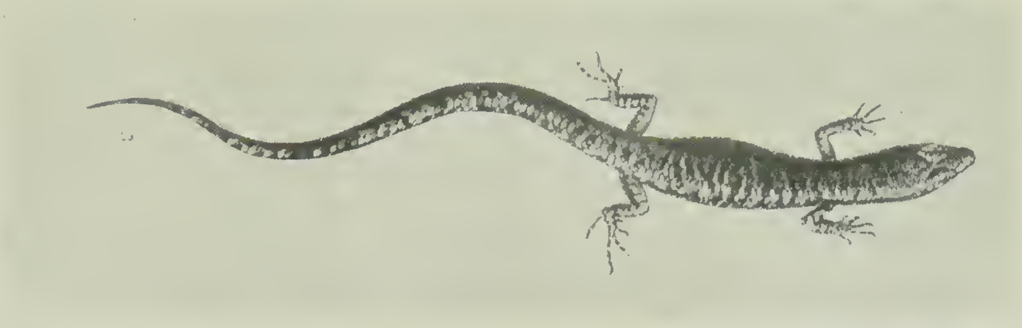
Lygosoma (Liolepisma) mustelinum.

L. pretiosum, from Victoria and Tasmania, and *L. ocellatum*, confined to Tasmania, are prettily speckled on the upper surface and greenish on the lower. The latter is the larger, 6 inches long, with some fifty scales round the middle of the body, while *L. pretiosum* is under 5 inches, and has about 36 scales in the circuit.



C. Frost.

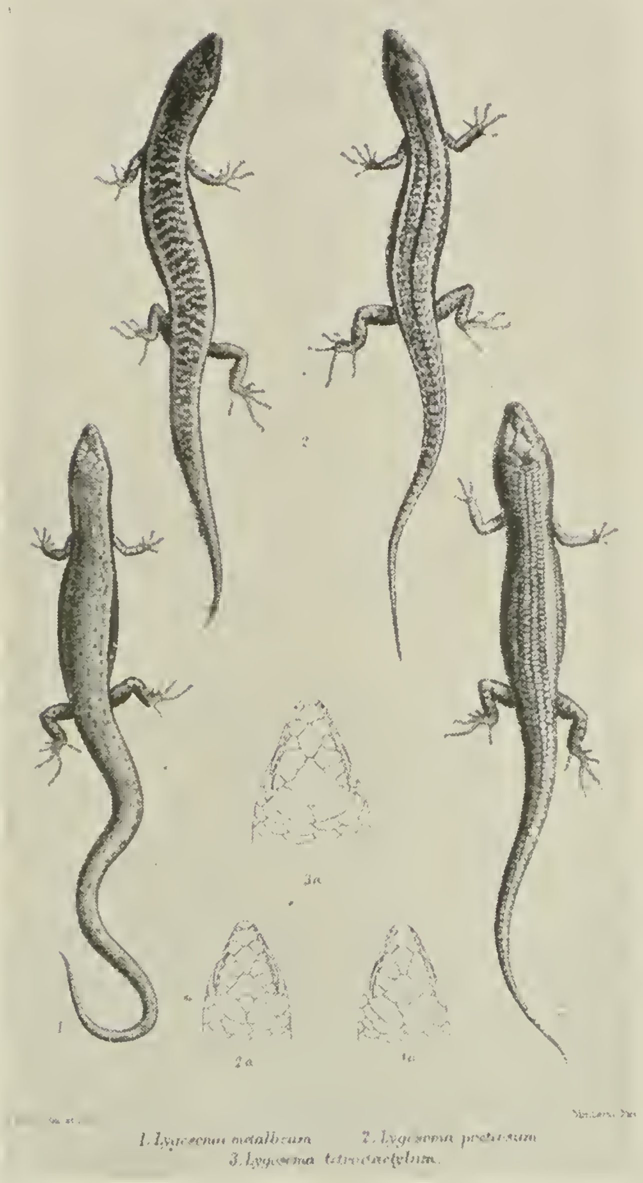
Lygosoma (Liolepisma) trilineatum.



Brit. Mus. Cat.

Lygosoma (Liolepisma) challengeri.

A number of the Queensland species are brown, and have only four fingers on the hand instead of five. Amongst them are *L. fuscum*, *L. peronii*, and *L. rhomboidale*.



Brit. Mus. Cat.

Three small Skink Lizards.
Lygosoma (Liolepisma.)
1. metallicum. 2 pretiosum. 3. tetradactylum.

Sub-genus Emoa.

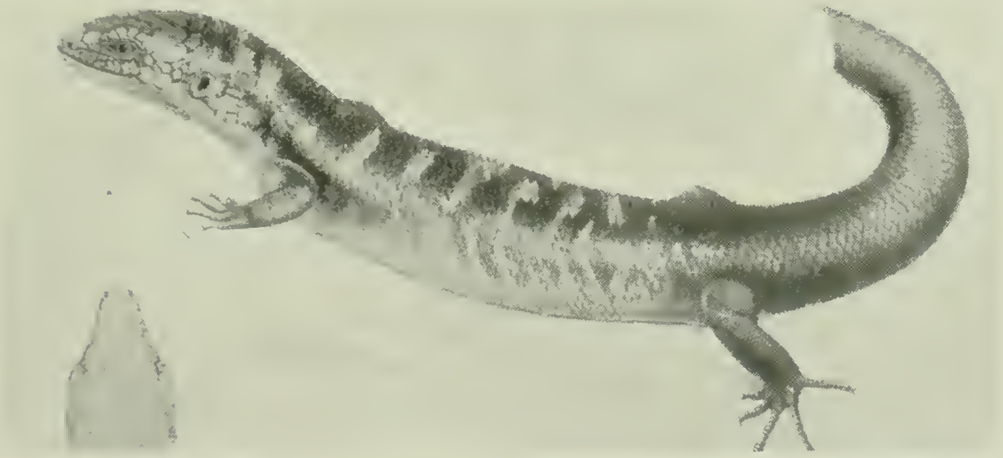
While the genus is abundantly represented in the Pacific Islands, only one species has been recorded from Australia, and this, curiously, from Victoria. It has been called *Emoa spenceri*.

Sub-genus Riopa.

Two species of large lizards of this sub-genus are Australian. *R. albofasciolatum*, over a foot long, brown with a brilliant opaline gloss, with more or less distinct yellowish-brown cross bands. *R. rufescens*, 14 inches long, plain brown, or with bands similar to those of its congener. They are very closely allied, if really distinct, and both hail from the extreme North, and extend over the adjacent islands.

Sub-genus Homolepida.

The most interesting is perhaps *H. casuarinae*, over a foot long, found in Tasmania and South-east Australia. It is dark or pale olive, and prettily speckled with black.



Brit. Mus. Cat.

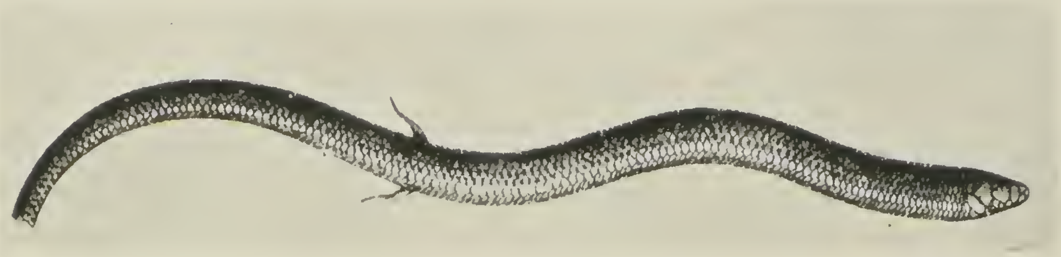
Lygosoma (Riopa) albofasciolatum.

Sub-genus Hemiergis.

The three species show an interesting gradation in the reduction of the digits. The limbs in all are very weak, showing the tendency to the crawling habit. In *H. peronii* there are four digits, in *H. decresiensis* three, and in *H. didactylis* there are only two. Length from 4 to 6 inches.

Sub-genus Siaphos.

In this sub-genus there is a similar gradation in the loss of the digits and reduction in the size of the limbs. In species from Celebes and the Philippines the limbs are sufficiently developed to overlap when those of one side are stretched towards one another. In our Australian species the limbs are weak and fail to overlap: in three of them the digits are still five in number, but in *S. aequalis* from New South Wales they are reduced to three.



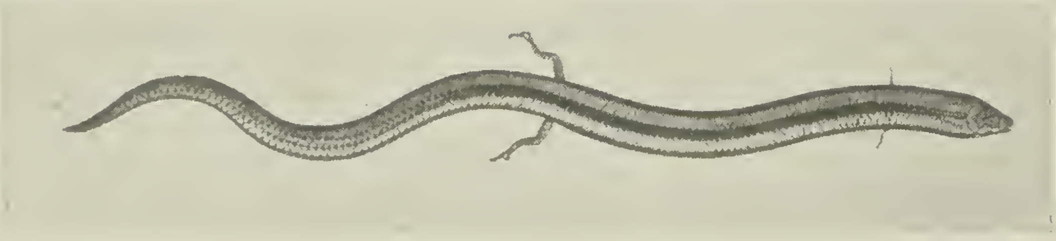
Brit. Mus. Cat.

Lygosoma (Rhodona) miopus.

Sub-genus Rhodona.

Worm-like lizards, which can make but slight use of their limbs for progression, and are mainly cryptozoic, residing, and not merely retreating or hiding, under stones and logs, in which situations they probably find associated snails, planarians, and insects on which to feed. They are most common in the West.

In *R. microtis* and *R. bougainvillii* both limbs and all five toes are present, though very feeble. In others the fore limbs are at least indicated; the digits 3, 3 in *R. fragilis;* 1, 2 in *R. gerrardii;* while in *R. miopus* the fore-limb itself is reduced to a tubercle. Lastly in *R. bipes* there is no trace left of the fore limb.



Brit. Mus. Cat.

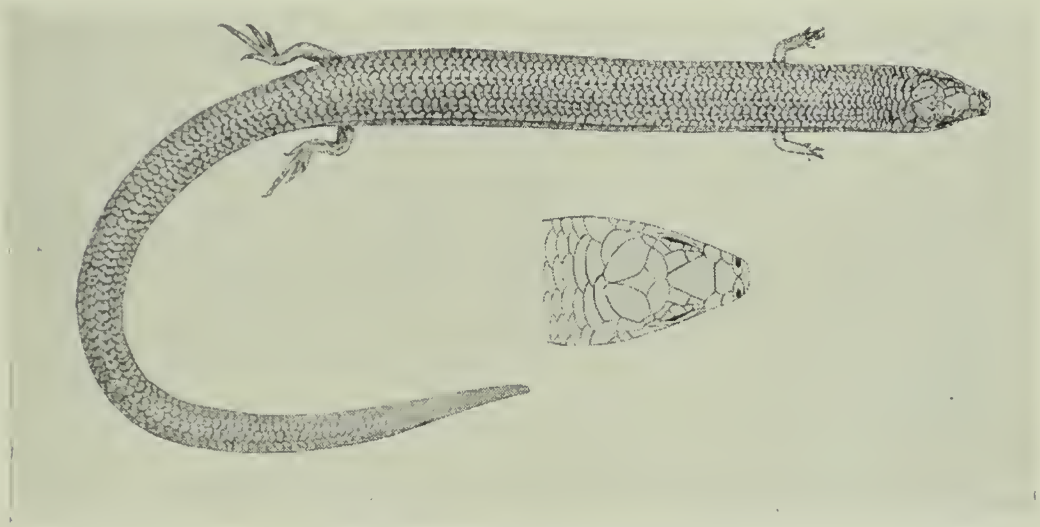
Lygosoma (Rhodona) gerrardii.

R. bougainvillii is of an elegant serpentiform shape, some 5 inches long, grey above with a black line along the side passing through the eye, and below of a rich yellow.

These worm or snake-like lizards may be easily distinguished at once from the Slow-Worms by the characteristic skink arrangement of the shields on the head.

Sub-genus Lygosoma (restricted).

To this belong half-a-dozen Eastern and especially Queensland forms. The largest, *L. reticulatum* and *L. verreauxii* are a foot or over long, but the limbs are exceedingly short, from a half to a quarter of an inch only in length. There are three toes on each limb in *L. reticulatum*. In *L. verreauxii* there are three toes on the fore limb, while the hind limb is undivided. In *L. truncatum* both limbs are present, but there are no digits. In *L. ophioscincus* the last stage is reached, and there are no limbs at all visible.



Lygosoma (Rhodona) tetradactyla. *Horn Exp.*

Genus Ablepharus.

There are no movable eyelids, but a fixed transparent disc covers the eye, as in the snakes. An Old World genus, save that one species, *A. boutonii*, appears sporadically in the hotter parts of both hemispheres, and another occurs in Nicaragua. This genus might be divided into sub-genera in much the same way as *Lygosoma*, for the ears of some species are hidden and of others distinct, supranasal scales may be present or absent and the limbs show similar stages of degeneration, though this degeneration is never carried so far as in *Lygosoma*.

The activity shown by the lizards varies with the extent to which the limbs are developed. Those with perfect limbs are day lizards, even more on the alert than the *Liolepismas*. Those with reduced limbs tend to a strictly cryptozoic life.

The commonest species are *A. boutonii* and *A. lineo-ocellatus*, both of which occur all over the Continent. Both are about 4 inches in length, and both vary greatly in colouring. Typically *A. boutonii* is olive, spotted with black, and has a light lateral band, while *A. lineo-ocellatus* has a black white-edged lateral band.

Genus Tropidophorus.

This genus is mainly distributed over South-east Asia and the Malay Archipelago. Mr. De Vis has described a species, *T. queenslandiae*, from Queensland. This is one of the host of Papuan forms which have gained a footing in Eastern Australia, doubtless reaching this continent before the formation of Torres Strait, which now forms a barrier to further immigration.

AMPHIBIA.

Cold-blooded animals which breathe air dissolved in water in the early part of their life, by means of gills, and as adults usually breathe air direct by means of lungs. Skin naked; skull jointed to the backbone by two condyles; the young hatched out from small uncovered eggs (spawn) in water or damp places, independent of the parents.

In Australia there are between 60 and 70 kinds of Toads and Frogs, but we have none of the lizard-like, eel-like, or snake-like Amphibians known as Newts, Salamanders, Axolotls, or Sirens.

General Characters:—The adult animal has a semi-circular or semi-elliptical head, broadest behind where it is articulated to the broad short body. There is no distinct neck. There is not even a vestige of an external tail. There are two pairs of limbs, of which the fore-limbs are the smaller and weaker, and function as arms, while the hind-limbs are larger, usually much larger and stronger, and form the main propelling organs in leaping, swimming, or climbing, and are the main instruments employed in burrowing. There are four fingers, the thumb being rudimentary, and there are five toes, which in the swimming species are connected by a web.

The skin is quite naked, and generally smooth, though the surface is frequently uneven from the presence of tubercular glands. Glands are always present in large numbers and secrete fluid, which renders the skin moist or slimy. The secretion is more or less acrid, and is fatal to small creatures, and when freely produced, as in *Notaden*, may deter even larger enemies from devouring the frog. The skin is of great importance as a respiratory organ, and if dried, as on undue exposure to our sun, or even if handled for a comparatively short time, the animal quickly dies. The colour and shades of the skin are due to the presence of colouring granules and large branched pigment cells. These latter are capable of contraction and dilatation, and by their varying phases produce quite extraordinary changes in the colouring of the frog. This is especially notable in the breeding season.

The eyes are of full size, on the ordinary vertebrate type. The *pupil* is a slit, horizontal or vertical in the different genera. There are two eyelids; the upper is large and pigmented, and has little power of movement; the lower is thin and semi-transparent, and resembles the nictitating membrane of a bird rather than an ordinary eyelid. This lid is drawn up to close the eye. There is always an internal ear, but while in most of our frogs the tympanum is plainly visible on the side of the head just in front of the fore-limb, in some the position of the ear is indicated only by a slight depression. There is no external ear. The tongue is soft and fleshy. It is attached to the floor of the mouth in front, with the tip pointing to the fauces when not in use. This attachment, of course, gives a greater range and reach to the tongue when darted out as a prehensile organ to seize insects. Gustatory organs are present.

The skull consists of a narrow linear cranial portion, with wide semi-circular jaw arches. In accordance with the lack of flexibility in the joint, the skull is articulated with the atlas vertebra by two *occipital condyles*, as in the Mammalia, and in marked distinction from the Birds and Reptiles, in which the occipital condyle is single. The teeth are small with pointed crowns. Their distribution varies with the species, but the only bones to which they are found attached are the premaxillæ, the maxillæ, and the vomers. They are of service in retaining the prey, and the tips are recurved for this purpose.

The vertebral column consists of an anterior half, in which the atlas, axis, and some seven other vertebræ form a jointed axis ending in the largest of the vertebræ, the *sacrum*, to the transverse processes (diapophyses) of which the long narrow ilia of the pelvic girdle are attached in front; and of a posterior half formed of a long narrow unjointed urostyle, which forms the skeleton of a sort of internal tail. In the sitting attitude of the frog, the hump which is so noticeable is not due to any arching of the backbone, but the front up slope of the hump is supported by the ascending spinal column, while the back down-slope is supported by the descending iliac bones. There are no ribs enclosing the thoracic cavity.

The shoulder-girdle, forming on either side the arch which supports the arms, consists essentially in each half of a flat broad dorsal scapula or shoulder-blade, extended toward the dorsal mid-line of the body by a supra-scapula to which it is broadly hinged, and of a ventral coracoid which is fan-shaped, opening out towards its fellow in the ventral mid-line of the body. The scapula and coracoid are thickened and strengthened at the head of the arch, where they combine to form the glenoid cavity which receives the head of the humerus. The coracoids do not meet in the mid-ventral line. In the *Ranidae*, including our *Rana papuana*, the coracoids are firmly united together by a single epicoracoid cartilage. In all other Australian Frogs there is a precoracoid (usually cartilage) as well as the coracoid, and these are connected by an arched epicoracoid cartilage. The epicoracoid of one side, usually the left, overlaps that of the other, thus allowing greater play for motion than in the *Ranidae*. The arch is still further supported and steadied by a long narrow bone, the clavicle or collarbone, which runs from the scapula, with the precoracoid if present, nearly to the midventral line, where it joins the omosternum. In the mid-ventral line the thoracic skeletal frame is continued in front of the precoracoids by a slender flattened omosternum, and behind the coracoids by a narrower partly bony sternum passing backwards into a thin cartilage, the xiphisternum.

In the pelvic girdle of the Australian frogs there is no such marked peculiarity as in the shoulder-girdle. The acetabulum, into which the head of the femur fits, is hollowed out of the three bones of the arch, ilium, ischium, and pubes, where they meet. The special feature in the pelvic girdle is the elongation of the ilia, which communicate the pressures induced by the great muscles of the hind-limbs to the sacrum, very nearly in the middle of the spinal column of the frog.

The bones of the hind-limbs or legs are much elongated, and serve for the attachment of powerful muscles, curiously arranged almost on the human pattern. The animals can take relatively gigantic leaps, both high and long jumps. The swimmers move rapidly by long and powerful strokes, in human fashion, though the arms are not employed. The *Hylidae* have small or large adhesive discs at the extremities of fingers and toes, and are adepts at climbing, making their way up tree trunks, walls, and even window panes. The burrowers, those in which the habit predominates, are provided with a large metatarsal tubercle, which aids in forming the foot into a shovel to assist them in their excavations.

Frogs are cold-blooded animals. The circulation of the blood is incomplete. The aerated blood from the lungs is returned to the left auricle, which, contracting, sends it on to the single ventricle; at the same time the right auricle, which has received venous blood from the body, contracts and forces it also into the ventricle. The ventricle contracting, pumps the blood thus mixed mainly into the aorta to supply the body, while a portion is returned to the lungs to be re-aerated. Thus the body is never supplied with fully aerated arterial warm blood.

The sexes are distinct. The coast district *Hylidae* usually pair in spring or early summer after the rains have fallen. Water is an essential for the development of the tadpoles. The frogs of the interior may pair and spawn any time when the rare rains give them their opportunity. At such favourable times the billabongs and ponds and waterholes are vocal with frog calls, calls of contentment with the abundant food supply and the pleasant conditions of moisture and temperature, and calls of love. In some species the males are furnished with vocal sacs one on each side of the mouth cavity. These communicate with the back of the cavity near the larynx, and can be distended by the air into balloon-like projections. They serve as resonators for the notes produced by the vocal chords. To one who has studied the notes, it is easy to distinguish the species by the plunk, the croak, the pipe, or the whistle, which is peculiar to each. The animals assume their gayest colouring, and frog life attains its culminating point in the pairing season.

Mr. J. J. Fletcher has observed the Frogs, especially those of New South Wales, far more closely than has any other naturalist. The following account of the facts known concerning the spawning of our Frogs is mainly taken by his kind permission from his notes on the subject:—

"With our Frogs there is much irregularity, and the ovipositing periods, instead of being brief and well-marked, are more or less prolonged and intermittent, a condition for which the irregular character of the rainfall is primarily and mainly responsible."

Mr. H. C. Russell, the late Government Astronomer, reports of a 30 years' record of Rainfall at Sydney: "There is not much difference in the average amount of rain falling in each of the first seven months, but a marked decrease is manifested in the last five, especially September, November, and December. . . . It is remarkable that during that period every month in the calendar, except December, has been the maximum for the year one or more times. . . . The evaporation in October, November, December, and January is greater than in the other eight months of the year." It must be remembered, too, that during hot winds from the interior the rate of evaporation is quite extraordinary, probably much surpassing anything known in Europe. With our longer or shorter droughts to take into consideration as well, it is easy to understand how our frogs, as well as the other members of the land fauna are closely dependent on the apparently capricious rainfall. Mr. Fletcher has found fresh spawn, of one species or another, in every month of the year.

Mr. Boulenger has drawn up a Synoptic Table of Frogs according to the deposition and development of the ova. As far as our species are concerned, it appears as follows:—

Group I.—The ovum is small and the larva leaves it in a comparatively embryonic condition.

A. The ova are laid in water.

To this section belong the great majority of Australian, as indeed of all other, frogs.

Group II.—The yolk-sac is very large, and the young undergoes the whole or part of the metamorphosis within the egg; at any rate the larva does not assume an independent existence until after the loss of the external gills.

A. The ova are deposited in damp situations or on leaves.

(*a.*) The embryo leaves the egg in the tadpole stage. To this section belong *Pseudophryne australis* and *P. bibronii*, observed by Fletcher, and probably the other forms of *Pseudophryne*, and *Myobatrachus gouldii*, a little known form from West Australia.

Mr. Fletcher says: "All the spawn observed by me has been (1) whity frothy-looking, more or less circular, floating patches, larger or smaller according to the species, deposited in the water; or (2) small submerged bunches of ova inclosed in clear transparent jelly attached to blades of grass or reeds, or twigs of dead branches; or (3) numerous separate ova not laid in the water but under stones, or débris in reed or grass tussocks on the edges of pools."

The first section includes the spawn deposited by observed species of *Limnodynastes* and the larger *Hylas.* Such spawn may be found intermittently from the middle of July to the following April or May, especially in August and towards the end of September. The ova are small and numerous, 1 to 1.5 mm. in diameter, the pigmented pole dark-brown to black, the rest white or whitish. The second section includes the spawn of *Crinia signifera, Hyla ewingii* var. *calliscelis,* and *H. phyllochroa,* and probably other small species of *Hyla.* This kind of spawn in inconspicuous bunches of 1 to 2 inches long, is symmetrically disposed round grass, or reed-stalks, or twigs, so that the spawn remains submerged just below the surface of the water. There are about 100 ova in a bunch, enclosed in clear jelly, evidently deposited by small frogs. The spawn of this section may be met with under favourable conditions at almost any time of the year, even in mid-winter. The third section includes the spawn of *Pseudophryne,* which may be found during summer and autumn. The ova are laid after rain in depressions or cavities, preferably under stones, but when these are wanting under pieces of old tin, under débris brought down by the water, or in a tussock of grass or reeds, near the margins of pools or creeks. Several hundred ova may sometimes be found in the same little cavity, but these have been deposited by several females. Each female lays about 90 ova. The ova are disposed in short rows or masses of a dozen or more, and would seem to be fertilised singly. They are about as big as peas, spherical, 3 to 5 mm. in diameter, twice the size of ordinary frog ova. If the ova do not get into water the hatching is simply postponed until they do, a proceeding which at any rate for a period of three months, provided of course that they are not absolutely deprived of moisture, seems to cause little inconvenience. There is an exceptionally large yolk-sac, and the period of hatching out under favourable circumstances is from a fortnight to three weeks, while the ova of the larger *Hylas* hatch out in four or five days. These facts explain the sudden appearance of large numbers of the tadpoles in pools and ponds after heavy rains.

There is nothing distinctive in the metamorphoses which the larva undergoes in Australian frogs. It successively displays the external gills, the internal gills, and the lungs of other tadpoles, with the corresponding adaptations of the circulation. The tail is absorbed and the limbs appear, as in other species.

The vicissitudes of the various Australian climates impose upon the frogs periods of both hibernation and æstivation. Though the ground is never frozen in winter, except in the South-eastern highlands, the lowered temperature and the bleak winds cause the frogs, like the snakes and lizards, to betake themselves for a time to the shelter of logs or stones, under which they rest in a more or less torpid condition. Possibly some of the water frogs bury themselves in the mud at the bottom of pools, as do those in the colder districts of Europe and America. The hibernation may be due to shortage of food supply as much as to climatic conditions.

During hot and dry periods the frogs must take shelter or perish. The stones and logs do not sufficiently retain the moisture requisite, and probably all forms burrow in the soft mud at the bottom of the rapidly drying up pools and water-holes. Several species have been observed in the act of burrowing, and others have been dug up from their subterranean retreats.

Key to the Families.

A.—FIRMISTERNIA. Coracoids firmly united by a single epicoracoid cartilage.	
Upper jaw toothed.	Ranidæ.
B.—ARCIFERA. Coracoids and precoracoids connected by an arched cartilage, the epicoracoid, that of one side overlapping that of the other.	
Upper jaw toothed.	
Terminal phalanges not having adhesive discs.	Cystignathidæ.
Terminal phalanges having adhesive discs.	Hylidæ.
Upper jaw without teeth.	Bufonidæ.

"One family, the *Cystignathidae*, is common to Australia and South America. Out of sixteen genera no fewer than thirteen are endemic. *Rana* is represented by one species in the Cape York Peninsula, and this genus, together with *Hyla* (and *Hylella*) may be regarded as an immigrant from the north. The stronghold of the endemic genera is undoubtedly the eastern and south-eastern coastal district, and though some of the more widely dispersed species may perhaps represent forms once more widely distributed but now separated by the gradual desiccation of the interior, others doubtlessly owe their wide dispersal to the remarkable power which they possess of accommodating themselves by burrowing and storing up water to districts which they can only traverse during irregularly recurring rainy seasons." (Spencer.)

Of the *Ranidae* there is but one Australian species.

Genus Rana.

R. papua.

Of the ordinary European and Asiatic type. Greyish above; an indistinct temporal spot; tympanum generally reddish brown; hinder side of thighs black and white marbled. Male with two internal vocal sacs, without arm-glands. Occurs in New Guinea, the islands of Torres Strait, and the Cape York Peninsula of Queensland.

Family Cystignathidae.

The Cystignathid Frogs are divided up into genera as follows, by an abridgment of Mr. Boulenger's classification.

	Pupil.	Tympanum.	Toes.	Vomerine Teeth.
Mixophyes	Vertical	Distinct	Webbed	Long series between the inner nasal openings (choanæ)
Limnodynastes	,,	Not or barely distinct	Free or nearly so	Long series behind the nasal openings
Phanerotis	Horizontal	Distinct	,,	,, ,, ,, ,,
Cryptotis	,,	Hidden	,,	Small groups behind the nasal openings
Crinia	,,	Not or barely distinct	,,	Small groups behind or about the nasal openings
Hyperolia	Vertical	Hidden	,,	Absent
Chiroleptes	Horizontal	More or less distinct	Webbed	Between nasal openings
Heleioporus	Vertical	Hidden	,,	,, ,, ,,
Philocryphus	,,	Distinct	,,	,, ,, ,,
Philoria	Horizontal	Not visible	Free	Two inclined rows behind the level of the nasal openings

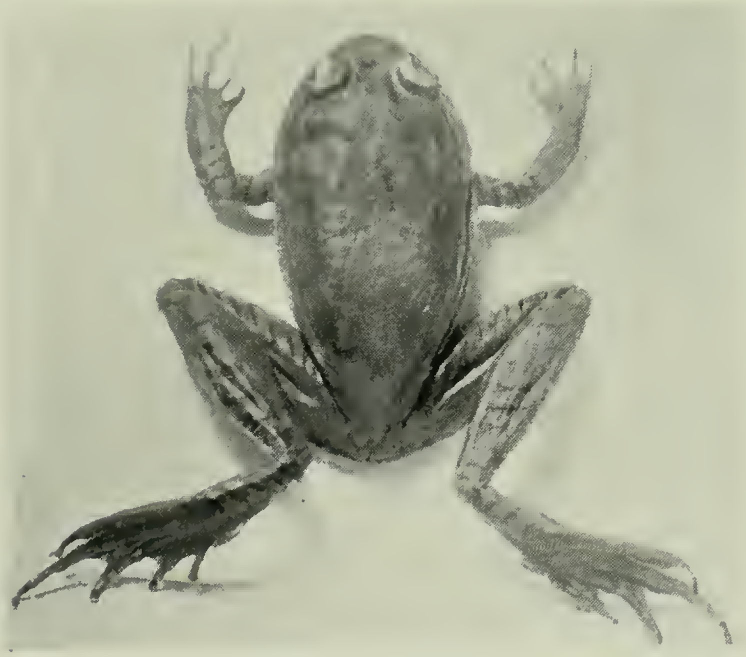
Genus Mixophyes.

M. fasciolatus is the only species known.

The Great Barred River Frog.

"Colour, brownish-olive above, indistinctly marbled with darker; a dark cross band between the eyes; a black band from tip of snout through the eye to behind the tympanum; limbs with narrow cross bars."—(Boulenger.)

Distributed in Illawarra, the Blue Mountains, the Northern Rivers of New South Wales, and Queensland. A diurnal frog haunting the banks of creeks in shady gullies, but attaining its greatest size in the sub-tropical or tropical rivers. Mr. Fletcher has specimens from the Tweed River, 4 inches from snout to vent, and with legs 8 inches. One in the Macleay Museum is a third as large again. It is by far the largest of our frogs, and is a most powerful leaper and swimmer. It takes readily to the water on being pursued. The narrow black bands on the legs are strikingly distinct, and numerous, 8 or 9 on the thigh and nearly as many on the lower leg; they are conspicuous in the limbed tadpoles. It probably breeds in the summer months, and oviposits in water in the ordinary way.



Spirit specimen.

Mixophyes fasciolatus.

Genus Limnodynastes.

Key to the Species.

I. Inner metatarsal tubercle small, blunt.	
Tarso-metatarsal articulation reaching beyond the tip of the snout: snout much longer than the orbital diameter.	L. peronii.
Tarso-metatarsal articulation not reaching tip of snout: 1st finger a little longer than 2nd.	L. salminii.
Tarso-metatarsal articulation not reaching tip of snout: 1st finger not quite as long as 2nd	L. dorsalis.
Tarso-metatarsal articulation reaching tip of snout: snout not longer than orbital diameter.	L. platycephalus.
Ankle reaches front edge of orbit: snout longer than orbit, as long as or longer than interorbit.	L. lineatus.
Ankle reaches hinder angle of eye: snout rather longer than orbit.	L. olivacens.
II Inner metatarsal tubercle large, shovel-shaped.	
A large parotoid-like gland on the calf.	L dorsalis.
No large parotoid-like gland on the calf.	L. ornatus.

L. peronii is recorded from Erromanga in the New Hebrides. The other species are all endemic.

L. peronii.

A moderately large Rana-like frog, 55 mm. from snout to vent, with well-developed limbs, the legs attaining 100 mm. in length. It frequents heavily timbered well-shaded country, and is very active in the open. It takes shelter under fallen logs.

Colour: dorsal surfaces of a dull ochreous stone colour, through burnt umber to a deep vandyke brown; two longitudinal stripes of olive green to a very dark green nearly black reach from the back of the head nearly to the vent, separated by a median stripe of the ground colour; a similar parallel stripe on each side extending from the shoulder, and often bifurcated behind; a band passing from the snout through the eye to the angle of the head, and a number of blotches on the limbs. The under surfaces of the head and body pale purplish, immaculate, and of the limbs purple. (Lucas.)

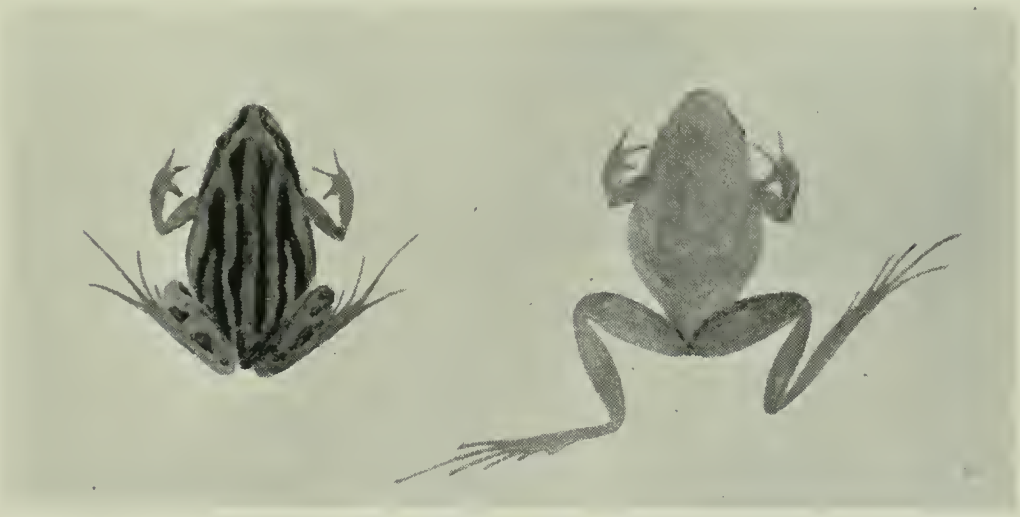
It is quite common to find the very young frogs with bright red or carmine longitudinal stripes on the back, corresponding with the lighter stripes of the adult, and also on the arms and legs. (Fletcher.)

An Eastern species ranging from Tasmania (one individual in the British Museum) through Victoria and New South Wales to Queensland, and recorded by the British Museum from Erromanga in the New Hebrides. Most likely includes *L. lineatus*. De Vis obtained at Mackay a smaller form.

L. salminii.

Olive above with round blackish spots: a blackish streak from eye to shoulder; three or more distinct yellow stripes along the back (becoming pink in spirit); sides of body and limbs blackish dotted with white; throat marbled with brown. Male with subgular vocal sac; female with fringe along second finger.

A beautiful frog, apparently confined to New South Wales and Queensland. It is found on the Richmond and Clarence Rivers, and thence North in the Queensland coastal district. It occurs in the plains of New South Wales about all the tributaries of the Darling which take their rise in the table-land. Mr. Rose says of it: "I cannot find that it burrows; it finds its way under logs and pieces of bark, lying very close but not appearing to have made any attempt at excavation."

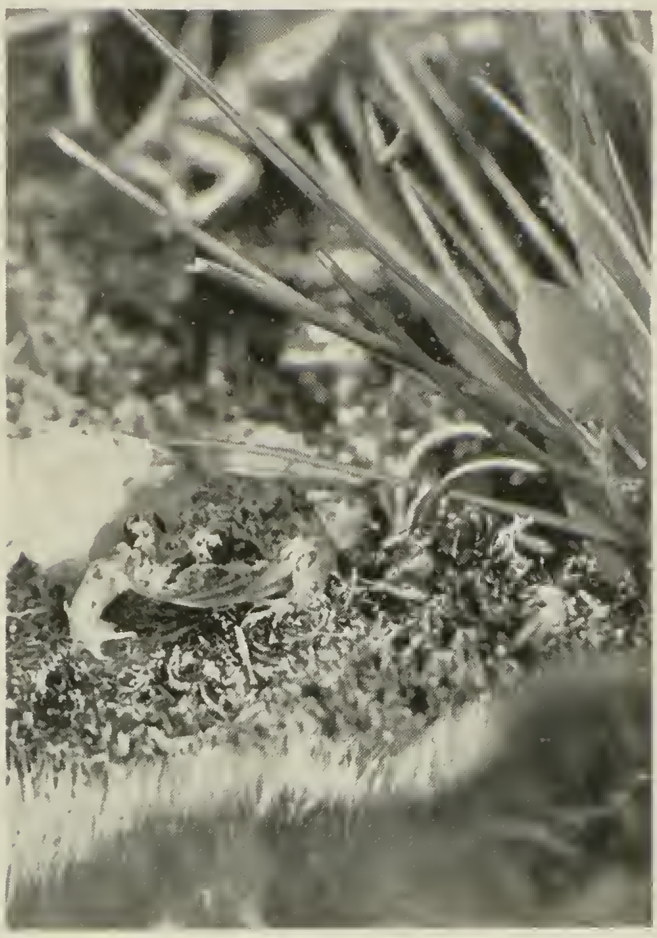


Limnodynastes peronii.

L. tasmaniensis.

An attractive little species, with rather flattened body, about 40 mm. long when adult, though Mr. Fletcher has met with specimens nearly 25 mm. longer, with limbs and digits moderately developed, rather adapted to an amphibian life among swamps than a powerful swimmer in open water.

The dorsal surface has a ground colour varying from a bismuth pink through dull ochreous stone colour to dark brown or nearly black, with three or four rows on each side of spots or blotches with ragged margins of a sap-green to dark olive green colour; these also appear on the dorsal aspect of the limbs. The very young frogs often show a distinctly red vertebral line, which may be pink, yellow, coppery, or absent in the adult. A narrow green band reaches from the snout through the nostril to the eye, and thence to the shoulder. Crimson spots are sometimes present on the upper eyelids. The under surfaces of the body are purplish—or bluish-white, and of the limbs purple. The throat in both sexes becomes yellow in the breeding season. The iris is golden-bronze or brassy.

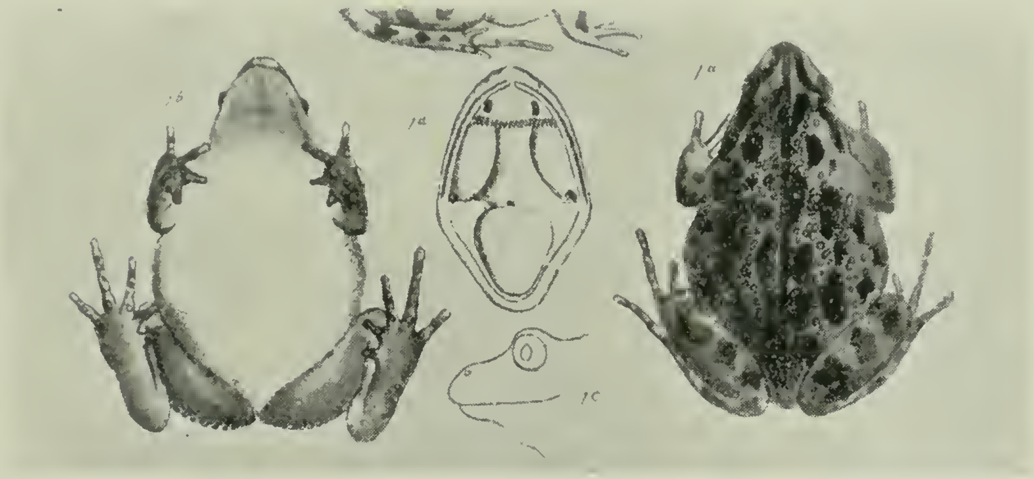


From life.
Limnodynastes tasmaniensis.

It is a widely distributed and variable Eastern species. throughout Tasmania and Victoria, the coastal district of New South Wales and South Queensland, and over the basin of the Murray. It is one of the commonest frogs to be met with in the neighbourhood of both Melbourne and Sydney, frequenting the edges of sheets of shallow water in favourable seasons, and taking shelter under stones and logs in the winter. It often spawns in ditches under overhanging ledges of the bank.

L. dorsalis.

A rather larger frog than *L. tasmaniensis,* being usually nearly 75 mm. long, and of a stouter build adapted to its burrowing habits. It " is easily distinguished from it by the large, swollen, oval gland on the calf of each leg, as well as by the darker colouring of the back and the dark chocolate marbling of the underside, the broader and thicker head, and the smaller number of tubercles on the underside of the ankle and wrist joints." (McCoy.) There is a large, soft, white tubercle on the inner edge of the metacarpus and a similar larger one on the inner edge of the metatarsus, both doubtless of service in shovelling the sand as it burrows.



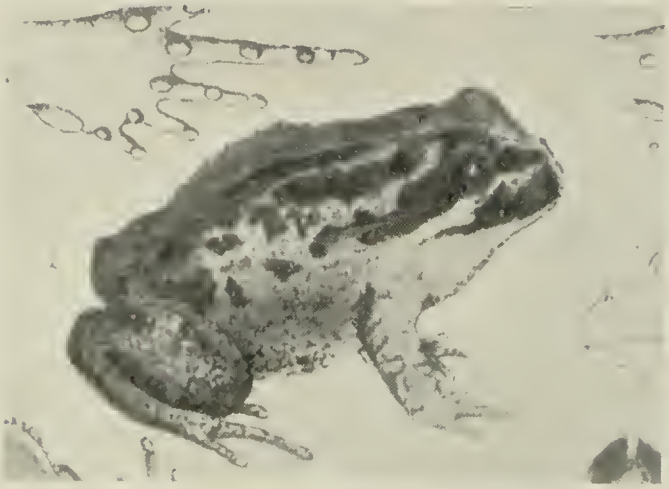
McCoy Prod. Z.V.

Limnodynastes tasmaniensis.

The ground colour of the dorsal surface is a warm cream or dull yellowish-grey, with large longitudinal patches, with ragged edges, of warm sepia or dark grey, broken with irregular spots behind. Legs and sides irregularly mottled with much smaller markings. A dark band from the snout to the eye and thence to the shoulder. On the under side the throat is cream or yellow ochre, sometimes with small markings, the belly bluish-white, marbled with small close vermicular markings of blue-black or chocolate, the legs purplish with less distinct markings.

One of our most widely distributed frogs, ranging over the whole of the continent except the centre. It is a common species in Tasmania, Victoria, and in New South Wales, in the coastal districts, the Riverina, and New England. It is not so frequently met with on account of its nocturnal and burrowing habits, but in the breeding season it betakes itself to the water, and may be captured with *Hyla aurea* even on the surface of deep water. It swims tolerably well.

"The oddest characteristic of this species is its habitually burying itself seven or eight inches under the surface of the light sandy soil of Brighton and other similar localities on the south coast, where it may be dug out any day in considerable numbers; only coming out by night to feed on the large nocturnal spiders which abound on the surface at the same time. These localities . . . . are entirely waterless, and the habit of coming to the surface and running over the ground by night introduces it to the snakes, which in such arid plains one would expect to have little chance of meeting batrachian food, of which it is evident they are very fond, from the abundance of the remains found on opening them." (McCoy.)



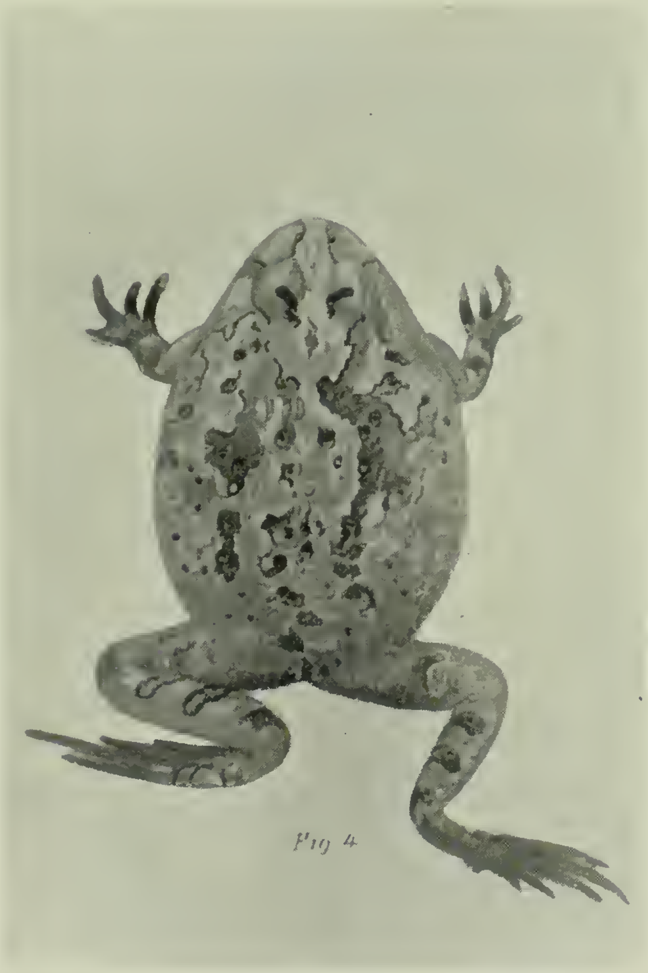
McCoy Prod. Z.V.

Limnodynastes dorsalis. Southern form.

Like all our widely distributed and dominant forms it exhibits great variation, especially in the colouring. The Brighton specimens figured by McCoy are much smaller than those usually met with, barely 50 mm. long. "The common Eastern form is almost uniformly dark, without spots (except light ones on the outlying parts), and without a vertebral stripe." (Fletcher.) Intermediate forms in size and colouring are met with between the typical Eastern and the spotted Western varieties. Both occur in Tasmania and Victoria.

L. platycephalus.

Allied to *L. tasmaniensis*, with much depressed head, a shorter snout, as long only as the orbital diameter, and longer limbs, the ankle stretching only to the tip of the snout. Adelaide.



Horn Exp.

Limnodynastes ornatus.

L. ornatus.

Olive above marbled with darker, generally a light dark-edged cross band between the eyes; sometimes a light spot on the occiput, sometimes a light vertebral stripe on the back; beneath immaculate. Male with subgular vocal sacs. Extends from the Northern rivers of New South Wales to Cape York, and is found in North Australia. In New South Wales it is met with on the tableland, and extends on to the Western Plains.

Genus Phanerotis.

P. fletcheri is the only known species.

A very elegant Rana-like frog. From snout to vent 33 mm., with well-developed limbs. Pale brown above, with few very small darker spots; a broad black band on the side of the head and shoulder involving the tympanum; a cross bar between the eyes; limbs with dark cross-bands. Under surface whitish, immaculate.

Heleioporus pictus.

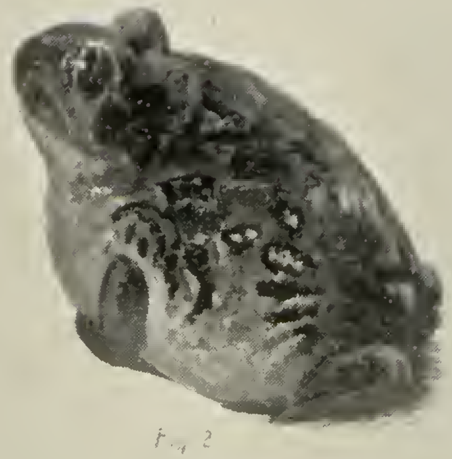


Fig 2

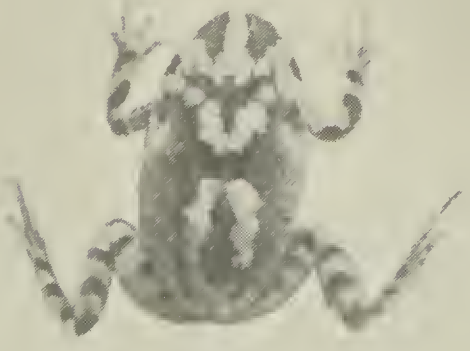


Fig 3

Horn Exp.

Limnodynastes ornatus. Young.

So far only known from the Richmond River, New South Wales.

Genus *Cryptotis*.

C. brevis.

The only species.

Tongue, sub-oval, entire. Outer metatarsals united. Omosternum rudimentary; sternum a cartilaginous plate. Head larger in the male; snout rounded with indistinct canthus rostralis; two long tooth-like processes in front of the lower jaw in the male, not known in any other Australian species. Skin smooth or slightly tubercular on the back. Male with subgular vocal sac. Colour, olive-brown above, spotted with darker; a large dark spot between the eyes; a dark streak from the tip of the snout to the eye; limbs cross-barred; lower surfaces black and white marbled. (From Brit. Mus. Cat.)

A rather small frog with oval body and pointed snout; 44 mm. from snout to vent.

An eastern species extending from Gosford, N.S.W., as far as Ipswich in Queensland. It is found on the Blue Mountains and in New England.

Genus *Crinia*.

The smallest of our cystignathid frogs, none of the species much above 25 mm. in length. *C. signifera* is an active little creature, the others are cryptozoic forms, met with under logs or stones on or in damp earth and vegetable débris.

Crinia signifera.

The Brown Froglet.

C. signifera.

The most active member of the genus, with well-grown legs and long free toes. The tympanum is quite hidden. The upper surfaces are of various shades of brown or umber or grey, lighter or darker, with a dark broadish band on the head extending backwards in two longitudinal bands separated by a median band of the ground colour. The limbs have narrow dark cross-bands, and the toes have successive darker and lighter rings of colour. As in the case of all the lower vertebrates the colour patterns are best seen in the young animal, as they often become less regular and more broken up in the adult. The under surfaces are dark spotted or marbled.

It probably occurs all over the southern half of the continent, in South-west Australia, in Tasmania, Victoria, and New South Wales. It is one of the commonest frogs about Melbourne and Sydney.

The Georgian Frog.

C. georgiana.

Tympanum slightly distinct; with or without vomerine teeth (Fletcher); lower surfaces granulate; limbs less developed in proportion to the body than in *C. signifera;* belly typically immaculate: loins and sides of thighs carmine; but the colour and pattern variable (Fletcher).

A Western form not recorded to the East of Port Essington.

C. tasmaniensis.

No vomerine teeth. Subarticular and metatarsal tubercles distinct. Toes fringed. Upper and lower surfaces smooth. The lower parts beautifully rose-coloured, largely marbled with black.

This Tasmanian form is only known from ''several specimens'' in the British Museum. Until large and distinctive series of the living animals can be obtained, it must remain doubtful whether it is really distinct from *C. laevis.*

The Smooth Froglet.

C. laevis.

Vomerine teeth of the usual character present, seldom missing; subarticular and metatarsal tubercles present or absent; upper and lower surfaces quite smooth; dorsal surfaces dark; ventral white with scattered brown or black spots, the white suffused with rosy or rosy-pink all over, or chiefly about the groin, and the thigh, knee, and tarsal-joints. (Fletcher.)

This is the typical Tasmanian form.

Mr. Fletcher has described an interesting perfectly smooth form from South-west Australia, which differs in details from the above, and which he has named *C. leai.*

Another variety, *C. froggatti*, obtained in hill country in Victoria and New South Wales, shows partial granulation beneath, has the belly dirty pale blue marbled or spotted with blackish; concealed (opposed) surfaces with carmine patches on a black background.

C. haswelli, obtained at Jervis Bay, shows again a relation with the granulated species; belly with light spots on a dark brown or blackish ground; carmine spots on the loins, hinder side of thigh and inner side of calf.

C. victoriana is found in timber country in Victoria. It is a quite smooth but darker form, with similar carmine markings, sometimes occurring irregularly on the back of the animal.

Genus Hyperolia.

H. marmorata.

The only species known.

Tongue elliptical, entire. No vomerine teeth. Outer metatarsals united. Omosternum rudimentary; sternum small, cartilaginous. Habit stout. Snout short rounded, with indistinct canthus rostralis (ridge between dorsal and lateral aspects). Fingers and toes blunt. Subarticular and metatarsal tubercles. The hind limb being carried forwards along the body, the tibio-tarsal articulation (ankle) reaches the shoulder. Upper surfaces minutely tubercular; a large parotoid gland on each side of the back of the head. Male with a subgular vocal sac.

Colour, brownish or olive above, marbled with darker; a dark triangular spot between the eyes; frequently a large white spot on the loin and on the back of the thigh; beneath greyish or brownish, spotted with darker. (After British Museum Catalogue.)

A small frog, 25 mm. from snout to vent, having the form and habits of *Pseudophryne*. It is an Eastern species occurring from Jervis Bay to Cape York. It is found on the coast, and on the table-land, and over the western plains of New South Wales. It is a cryptozoic form, common about Sydney, living under stones. Mr. Fletcher thinks that it oviposits in the fashion of *Pseudophryne*.

Genus Chiroleptes.

The following is Mr. Boulenger's synopsis:—

Key to the Species.

I. Toes entirely webbed; tympanum indistinct; tongue entire.	C. platycephalus.
II. Toes not more than half-webbed; tympanum very distinct.	
1. Inner metatarsal tubercle large, shovel-shaped; no outer tubercle.	
Tongue subcircular; nostril equally distant from eye and tip of snout; toes hardly one-third webbed.	C. brevipalmatus.
Tongue elliptic; nostril a little nearer tip of snout than the eye; toes not half-webbed.	C. brevipes.
Head large; snout twice the greatest orbital diameter; toes nearly half-webbed.	C. australis.
Head moderate; snout not twice greatest orbital diameter; toes half-webbed.	C. alboguttatus.
2. Two metatarsal tubercles, inner small, but little larger than the outer. Tympanum close to the eye.	C. inermis.

Burrowing frogs, able to survive drought conditions. *C. australis* is recorded from West Australia, from North Australia and from Queensland extending into Northern New South Wales. *C. platycephalus* lives in the plains of New South Wales. and is the famous Water-holding Frog of Central Australia. The others are Queensland frogs.

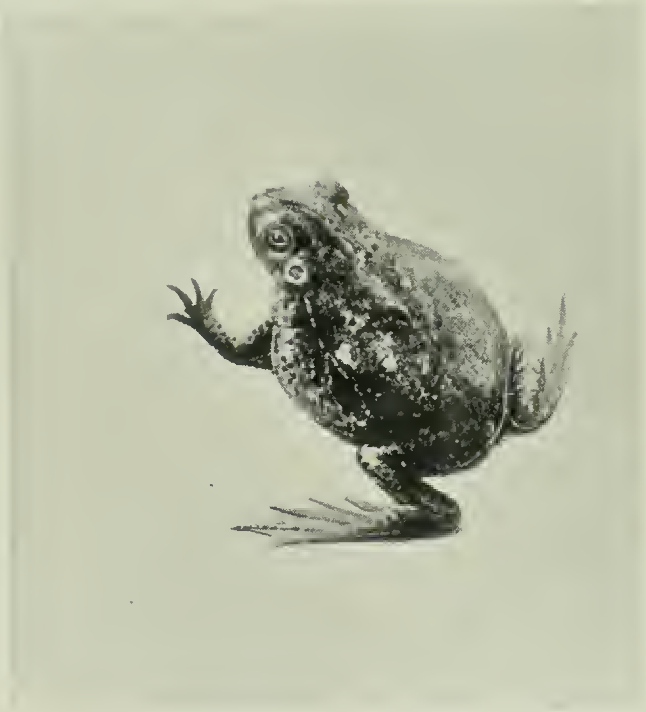
C. platycephalus.

Mr. Fletcher received some lots of living specimens in tins of earth. sent by Mr. J. H. Rose. from near Walgett on the Namoi River. He says: "I kept them for some time in a vivarium with a layer of earth on the bottom sufficiently deep to allow them to burrow comfortably out of sight. On turning them out of the tins of earth in which they came they were found snugly ensconced in little chambers below the surface; the soil being clayed. it appeared to me as if after having reached the bottom of the tin the frogs. perhaps by puffing themselves out. and by turning themselves round and round. had succeeded in pushing back the earth. and by pressure in puddling the clay to some extent. so forming a little chamber with firm walls. a supposition to which the portion of the chamber sent me by Mr. Rose also lends support."

Mr. Fletcher watched them burrowing in earth. "The hind legs in burrowing are moved outwards and downwards. either alternately or simultaneously. the shovel-shaped metatarsal tubercle evidently coming into play. All these burrowing species have the metatarsal tubercles of this character. the presence of which I think may be taken as *primâ facie* evidence of the burrowing propensity of their possessor."

Except at the breeding time they are rarely met with out of their hiding places. occasionally coming out in wet weather and at night. They are then for the greater part of the year of very retiring habits. and their colouring is dull and agreeing with that of the soil in the locality. The Namoi specimens were "above of an olive-grey or greyish-brown much freckled with darker spots and blotches. but without any definite pattern; beneath white. the throat of the male slightly and finely dotted with darker." So Professor Spencer describes those dug up in the Central region during the dry season as being of a dull dirty yellow "like the water and the dried up banks and the vegetation."

He describes a different picture after the drought has broken up and the magic-working rains have fallen. "Standing by a water-hole or clay-pan, though you can hear the frogs croaking all around, you cannot so easily see them. The surface of the water is flecked with long stalked floating leaves of the Nardoo plant (*Marsilea quadrifolia*) which are fully grown, while the permanent short-stalked leaves around the base are as yet only beginning to develop and are covered with water. If you disturb the water you will see a number of little green patches which you have probably taken for Nardoo leaves, suddenly disappear. These are the heads of one or two kinds of frogs (either *Chiroleptes platycephalus* or *Heleioporus pictus*) and you are all the more surprised because, if you have only seen them before in the dry season, you were not at all prepared for such a transformation in colour. Now they are yellow and orange and green like the water, which is thick with yellow sand and mud particles, and dotted with bright green Nardoo leaves."



Horn Exp.

Chiroleptes platycephalus.

"Sooner or later the clay-pans and water-holes dry up, and to all appearance animal life has completely died out. In the case of the Estherias, Apus, Rotifers, and Polyzoa the animals have all perished, but their eggs remain and can be blown about from one place to another by the strong winds which often prevail throughout the dry months, and they are ready to develop as soon as ever the water-holes are again filled. In the case of the other members of the clay-pan fauna it is quite different, for if you know where to look for them you will be able to find them hidden away safely æstivating. They have one and all gone down into the mud while it was soft and in this, which becomes so hard that you can only break it away bit by bit, they lie imprisoned until released by the next heavy rain. Probably many of them perish if the drought be of exceptional length. The most interesting animal is the Burrowing or Water-holding Frog (*Chiroleptes platycephalus*). As the pools begin to dry up it fills itself out with water, which in some way passes through the walls of the alimentary canal filling up the body cavity and swelling the animal out until it looks like a small orange. In this condition it occupies a cavity just big enough for the body and simply goes to sleep.

When, with the aid of a native, we cut it out of its hiding place, the animal at first remained perfectly still with its lower eyelid completely drawn over the eye, giving it the appearance of being blind, which indeed the blacks assured us it was. It is said that a black fellow when travelling over such country as this, where in times of drought there is not a drop of water visible, will use these frogs as a water supply. A native will tell you at once where to dig for a frog, being guided by faint tracks often indistinguishable to the unpractised eye of the white man. He will also obtain water from the roots of certain mallee gums and other trees, such as the Hakeas and Casuarinas. A white man may search in vain for such water supplies but a black fellow will know by instinct where to find them."

Genus Heleioporus.

The Great Western Burrowing Frog.

H. albopunctatus.

Habit very stout. Snout rounded without a canthus rostralis. Fringes blunt; toes short, blunt hardly half-webbed, inner metatarsal tubercle large shovel-shaped, the tibio-tarsal articulation reaches the shoulder. Skin smooth, shagreened on head and back. A large parotoid gland on the side of the head not conspicuous externally.

Colour, brownish with white rounded spots, or reddish white marbled with brown. Young: olive above with more or less conspicuous brown spots, and a dark streak from tip of snout to eye. No vocal sac. Conspicuous black, conical spines on the fingers of the male in the breeding season.

Confined to Western Australia and the Northern Territory of South Australia. Represented in the East by *Philocryphus.*

The Green Burrowing Frog.

H. pictus.

A plump but very much smaller species than *H. albopunctatus.* The toes are fully webbed. There are two brownish rugosities on the inner side of each hand, and the large black inner metatarsal shovel tubercles are so conspicuous that they at first glance indicate the species. Colours, dorsal surface light sage green with pattern of dark sage green markings; a dull yellow vertebral line. The sides green blotched with black. Ventral surface light greenish grey. Throat spotted or flecked with dull green. (Typical Victorian specimen.—Lucas.)

Mr. Fletcher's specimens from the Riverina were "above pale olive with darker spots and patches, tolerably uniform but lighter on the flanks and limbs, and with a wash of bright yellow about the thighs and upper arms, a faint vertebral line."

Professor Spencer remarks on the dull yellow colour of the frog in the drought times of the Centre, and the marvellous change to green when the animals are breeding in the pools, a green as bright as that of the Nardoo leaves. Length from snout to vent 40 mm.

This burrowing frog is not uncommon in the neighbourhood of Melbourne, and is usually met with hiding under stones or logs. It spread north through Bendigo into the Riverina and thence into the Central interior where, owing to its burrowing skill, it has maintained a position in the Lower Steppes. Like

Chiroleptes platycephalus it takes up an internal supply of water and assumes a globular shape. It has similarly the power of inflating itself into a ball with air. Mr. Fletcher has had specimens from the table-land of New South Wales, but does not record it from the coastal region.

Genus Philocryphus.

The Great Eastern Burrowing Frog.

P. flavoguttatus.

A remarkably large frog, which has only been met with, and that sparingly, in the neighbourhood of Sydney and in the Blue Mountains. It is of stout build, more like a toad than a frog, 90 mm. long from snout to vent. The limbs are short and stout. The skin is glandular warty above and smooth over the greater part of the under surface. The upper surfaces are purplish-grey or bluish-black, the sides of the body and the region about the vent much spotted with yellow, a short yellow line above the angle of the mouth below the tympanum, the throat dusky and the belly white.

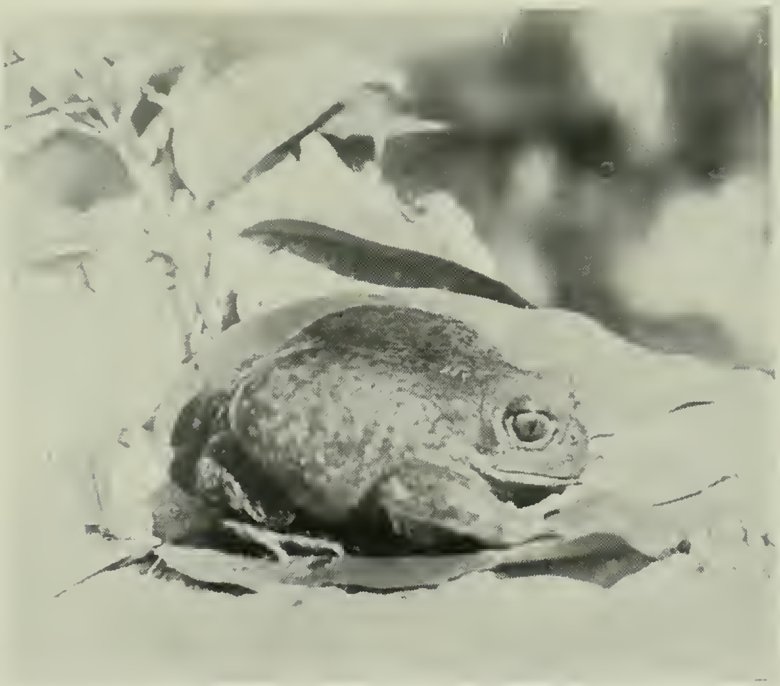
The animal burrows, or hides in ready-made holes. Occasionally one comes across one in digging or forking the garden. When handled, and especially if tickled or scratched on the back, it distends itself in a remarkable way, becoming nearly as round as a ball, and sometimes on such occasions it cries in the weirdest fashion just like an infant.

Mr. Fletcher remarks that this habit of inflating themselves football-wise is common to this and other burrowing forms, *Limnodynastes dorsalis, Chiroleptes platycephalus* and *Notaden bennettii,* and he suggests that while it may be of some protective value as a deterrent to their enemies, it may be possibly of prime importance in their burrowing operations. He says that several times when keeping these frogs in a vivarium with several inches of loose earth on the bottom they entirely disappeared, leaving the surface so level and apparently undisturbed that without actually unearthing them their exact whereabouts was not evident. They are undoubtedly adepts at burrowing, even in stiff soil, and it may be that they prop up or keep open in this way a section of the burrow while they are working below with their short blunt partly-webbed toes at the next section.

The spawn develops when there is sufficient water in the hole to partly cover it. The ova are unusually large, and are laid in large white frothy masses. The embryo acquires large external gills before hatching, the period of incubation being a fortnight.

The male is without vocal sacs, but in the breeding season develops a row of black horny conical tubercles on the upper surface of the first three fingers.

This species appears to represent in the east the similar large burrower, *Heleioporus albopunctatus*, of Western Australia, which it resembles in many ways, but can be at once distinguished by the presence of a well-marked tympanum.



From life.

Philocryphus flavoguttatus.

Genus Philoria.

P. frosti.

Habit stout like that of *Heleioporus pictus*. Pupil horizontal. Tongue subcircular, slightly nicked. Vomerine teeth in two inclined rows behind the level of the choanæ. Fingers and toes free, the tips not dilated. Outer metatarsals firmly united. Diapophyses of sacral vertebræ distinctly dilated. Length from snout to vent 44 mm.

Colour: Upper surfaces of body and limbs a general dark brown with here and there small irregular light patches; groins and under surface of body and limbs yellowish, mottled with brown. (Spencer.)

Only known at present from Mount Baw Baw, Victoria. It was curiously at first *collected*, unintentionally, for science by a "Tiger" Snake (*Notechis scutatus*), which was captured alive by Mr. C. Frost. He kept the snake in a bag for two days, and then Mr. Frost found on opening the bag that the snake had disgorged five examples, evidently eaten not long before capture. Afterwards living specimens of the frog were obtained by Mr. Frost, and served to afford the description given by Professor Spencer.

Family Bufonidae.

The Australian genera of the Bufonidae or Toads proper, may be distinguished from one another by the following table:—

	Pupil.	Tympanum.	Toes.	Vomerine Teeth.
Pseudophryne	Horizontal	Absent	Free	Absent
Notaden	,,	Hidden	Webbed	Present
Myobatrachus	,,	Distinct	Free	Absent

Toadlets.

Genus Pseudophryne.

The Yellow-crowned Toadlet.

P. australis.

"A lively perky little frog very partial to damp shelves and cracks in the Hawkesbury sandstones." (Fletcher.)

One or two small rounded metatarsal tubercles; tip of longest toe reaching beyond the eye. A flat oval gland on back of each thigh in the male, and an internal vocal sac. 20 mm. in length.

Blackish-brown above; forehead with orange or yellow broad T-shaped mark: a yellow median streak near the vent, and yellow or white spots on arms and thigh: under surfaces blackish with large yellowish spots.

Apparently a very local species with Sydney as its headquarters, and not found outside a radius of seventy miles from that city. Probably recorded in error from West Australia. (Fletcher.)

Dendy's Toadlet.

P. dendyi.

A small form 15 mm. from snout to vent; hind limbs 12 mm. Of remarkable colouring, being coal-black above, with no yellow crown like *P. australis*, but with a yellow streak near the vent, and yellow spots on arms and thighs; under surfaces of throat and belly coal black, marbled with irregular white blotches.

A single male specimen found under a log on a wet flat near the Wellington River, North Gippsland. A species founded on a single specimen is always unsatisfactory, and it is possible that other forms in the intervening areas may ultimately connect with *C. australis*, but the colouring is strikingly different as well as the habit, and there is no oval gland on the thigh.

Bibron's Toadlet.

P. bibronii.

A much less active animal than *P. australis*, usually makes little or no effort to escape when uncovered in its hiding place, "shams dead" when placed on its back, and falls to the bottom like a stone when thrown into water, breeds in early winter unlike *P. australis*, which breeds in summer. (Fletcher).

Large specimens reach 31 mm. in length. The metatarsal tubercles and relative length of leg as in *P. australis*. An oval orange-coloured gland on the back of each thigh in the male.

Three colour varieties have been distinguished, of which one *P. semi-marmorata* is recorded from S.E. Victoria and Tasmania, another *P. coriacea* is found on the Northern Rivers of New South Wales and in Queensland, while the original typical *P. bibronii* is found over the greater part of the three Eastern States up to Cape York.

P. bibronii.—Brown or olive above, variegated with darker; yellowish areas on upper arms and thighs; beneath marbled on throat and belly with brown or black and yellowish.

P. semi-marmorata.—Olive green with darker spots above; under surface of throat and limbs pale greenish yellow, generally immaculate, of belly light olive green marbled with white.

P. coriacea.—Yellowish-brown above; sides blackish; under surfaces black and yellowish marbled.

Attention has already been directed to the peculiar method of oviposition in *Pseudophryne.*

The Burrowing Toadlet.

P. guentheri.

Two large oval compressed metatarsal tubercles on each foot; tip of the toe not reaching beyond the eye. A large parotoid gland on each side of the head. Hind limb very stout, the longest toe not reaching beyond the eye. Upper surfaces with prominent smooth warts more or less confluent into lines. Male with large flat oval lumbar gland.

Colour: Brown or olive above; forehead and a few large markings on the back lighter. Beneath whitish immaculate, slightly spotted or delicately marbled with brown.

In the North-west and South-west of Western Australia. The large lumbar or thigh glands conspicuous in so many of the burrowing forms are perhaps connected with the lubrication of the burrowing tools.

Genus Notaden.

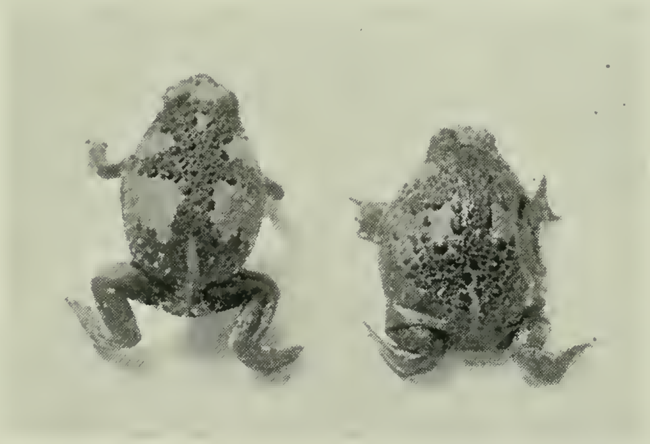
The Cross-bearing Toad.

N. bennetti.

Habit extremely stout. Two small bony prominences close together behind the level of the choanæ. Head very short and high; mouth very small; tongue circular, entire; eye moderate, two dermal ridges on the head; tympanum hidden. Limbs short, clumsy; fingers and toes short, depressed, latter webbed at the base; outer metatarsals united; a large shovel-shaped inner metatarsal tubercle. Omosternum and sternum rudimentary, cartilaginous.

The "Catholic Frog," or the "Holy Cross Toad," as it has been called, is one of the most interesting of our species. It is met with in the country west of the Divide in Queensland and New South Wales. Mr. J. H. Rose says: "I first noticed it in January, 1885, after a heavy fall of rain lasting ten days, off and on, and succeeding a long and severe drought. I was living at that time on the Merri Merri Creek, thirty-six miles from Coonamble. These toads were then very plentiful, and seemed to come out of the earth. I have seen them all over the plain country, both on black and sandy soil. Here at Euroka I have dug them out of a soft loamy flower-bed in front of the house at a time when the earth was commencing to get dry; during comparatively dry periods they disappear, but reappear as soon as a few points of rain have fallen. I can safely say they were to be found here at all times during the last twelve months, though at times during the hottest part of summer only under logs and in damp places. After a heavy fall of rain they simply swarm. . . . . Some that I have seen have been very much lighter in colour than others; one could truthfully have called them yellow. They hop along with short quick strokes; and if teased or interfered with will stand up with bodies above the ground on all fours, and puffing themselves out to an absurd size will face their tormentor in a defiant manner."

Similarly Rev. J. M. Curran, F.G.S., writes: "On two occasions recently I have noticed large numbers of Hervey's frog (*Notaden bennettii*) on the Macquarie River, about four miles down stream from the locality known as the Macquarie Cataract. On each occasion there had been recent rather heavy rains. Before the rains no frogs were visible, but after a downpour of five hours the frogs appeared in thousands. . . . I heard on good authority that the blacks used to use these frogs for food. I myself saw an old gin seemingly enjoy as a dainty morsel the muscular thighs of the frog, eating them quite raw with a little salt. They are called Hervey's frogs from a fanciful resemblance of the pattern on the creature's back to the letter H, this being Mr. Hervey's sheep brand."



Spirit specimens.

Notaden bennettii.

Notaden is a rather small true Toad, measuring up to 40 mm. from snout to vent. When alive it is, says Mr. Fletcher, a batrachian of quaint and striking appearance, and, when looked at, for example, in a white dish, the bright yellow, red and green tints and the H shaped marking on the back are very conspicuous. The characteristic pattern is due to an arrangement of black glandular warts or papillæ of several sizes, together with small isolated patches of ferruginous or orange red, and in places white spots, on a greenish background, the pattern being thrown up by contrast with sundry symmetrically grouped areas freer from papillæ and of a lighter bright or greenish yellow tint. The outer surface of the arms and legs are also spotted with red, and the back of the thighs with white on a dark ground.

From the glands there exudes a copious yellow secretion, probably acrid, when the animal is handled, and we have seen that it puffs itself out at the same time. Hence the coloration is probably rather warning than protective, and this is supported by the unusual habit of appearing in great numbers in the open, and in the daytime, without any attempt at concealment, a habit not known in the case of any other Australian frog. Probably snakes and birds, which have not learned like the black-fellow to skin their prey before they eat it, are deterred from attacking so brilliantly coloured a morsel, which it is difficult to get hold of and unpleasant to taste. It has been observed to feed freely on ants.

Genus Myobatrachus.

The Small-headed Toad.

M. gouldii.

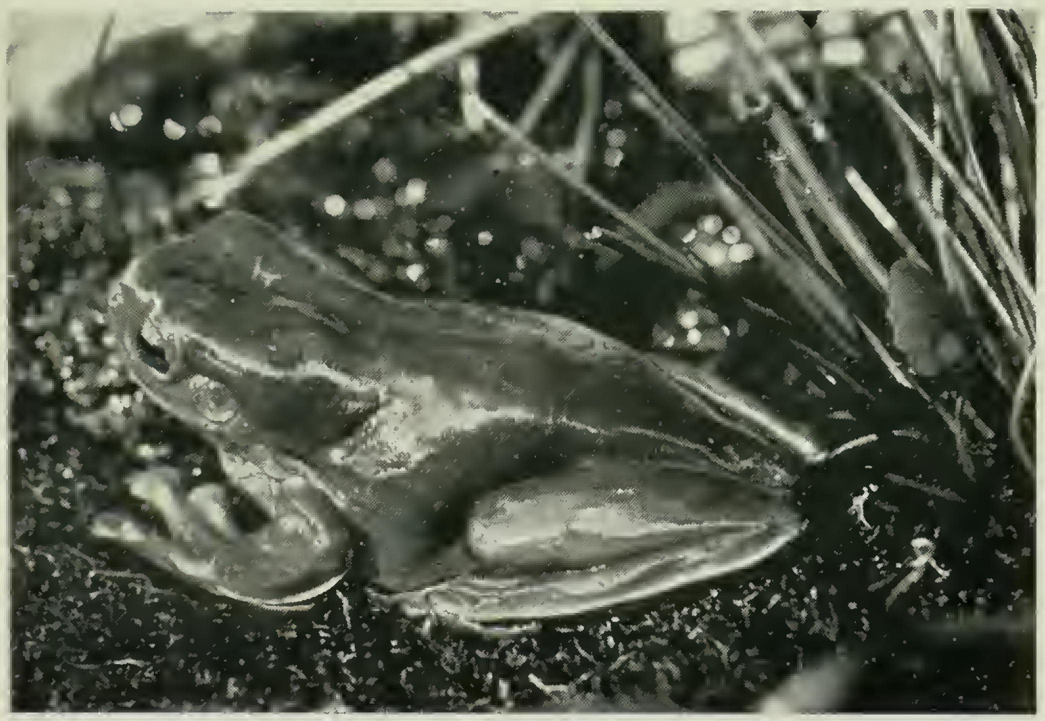
Habit extremely stout. Head very small with short rounded snout; canthus rostralis absent; crown swollen; tongue small, elliptical, free; eye very small, pupil horizontal (Fletcher); tympanum more or less distinct, rather larger than the eye. Limbs excessively short, fore limb very strong, adapted for burrowing; fingers and toes free, former short, much depressed; sub-articular tubercles indistinct, two rather indistinct flat metatarsal tubercles, outer largest. Other metatarsals united. Epicoracoid cartilage narrow, scarcely overlapping; no omosternum, sternum ossified on median line. Skin smooth or with small scattered tubercles. Male with subgular vocal sac. Colour: Above greyish brown; beneath lighter. (From British Museum Catalogue.) From Western Australia. Very likely feeds on the termites as well as other insects.

Family Hylidae.

With vomerine teeth—*Hyla.*
Without vomerine teeth—*Hylella.*

Genus Hyla.

The Australian species fall naturally into two divisions, according as the animals are adapted for climbing habits or have the habits of ordinary marsh frogs. The latter were collected in the genus *Litoria*, which Mr. Boulenger merges in *Hyla* on general anatomical grounds. In the climbers the head is rounded and broad, and the discs borne by the fingers and toes are relatively, sometimes very, large, the fore limbs being better developed. In the *Litorian* group the head is more pointed, and the discs are small, while the fore limbs are less developed. The under surfaces are immaculate and usually whitish. *Hyla caerulea* is the largest species, followed by *H. aurea*; *H. ewingii* is among the smaller. These are the three commonest and most widely distributed species.



From life.

Hyla caerulea.

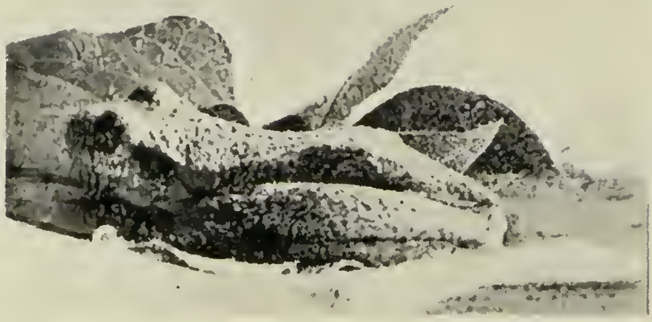
We shall give a short diagnosis of the species, with a fuller account of a few of the more interesting or striking. The dimensions and colours are mainly taken from the British Museum Catalogue.

The climbers or tree-frogs as they are called are scarcely to be considered arboreal in their habits. They sit on bushes, shrubs, or small trees, but are not known to climb to any height up the larger trees. They include

The Green Tree Frogs.

H. phyllochroa.

36 mm. from snout to vent. Green above, flanks and sides of thighs purplish brown; a narrow black line with white upper edge from the eye to the shoulder. Fingers free or webbed at base. Angular canthus. Coastal district of New South Wales.



From life. *A. J. Hamilton.*

Hyla peronii.

H. gracilenta.

40 mm. Green above, a white line on the side of the head, another on outer edge of forearm, tibia and tarsus. Fingers at least one-third webbed. Angular canthus. Northern rivers of New South Wales and Queensland.

H. caerulea.

90 mm. Green above with white dots on the sides. Fingers at least one-third webbed. Rounded canthus. Western Australia, New South Wales, and Queensland.

The Brown Tree Frogs.

H. peronii.

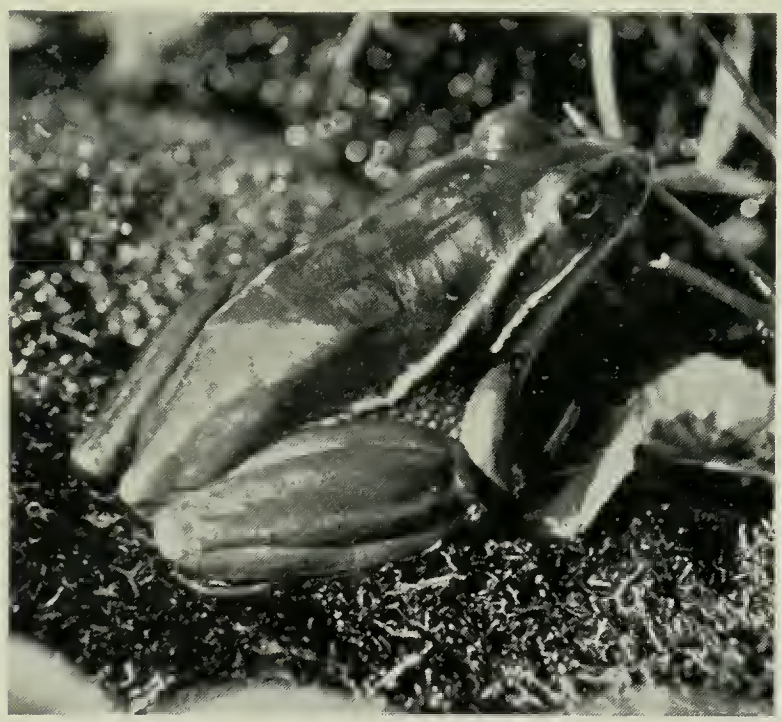
57 mm. Brown or olive above, more or less distinctly dotted or marbled with darker; groin and sides of thighs and sometimes axilla black and yellow marbled; sometimes rather indistinct vertebral line; throat often variegated with brown. Fingers at least one-third webbed. Western Australia, New South Wales, and Queensland.

H. rubella.

39 mm. Greyish or reddish-brown above, uniform or speckled with darker; dark band on side of head and body. Vomerine teeth behind choanæ. Western and Central Australia, New South Wales and Queensland.

H. dentata.

48 mm. Brown or greyish olive above, minutely speckled with darker; a lighter zone on each side of the back; dark streak along the canthus rostralis, eye, tympanum to shoulder. Vomerine teeth behind choanæ. Coastal district of New South Wales.



From life.

Hyla aurea.

H. maculata.

50 mm. Olive-grey, blotched with darker markings. Vomerine teeth behind choanæ. Victoria.

H. ewingii.

42mm. Brownish to greyish-brown above, dark streak on canthus and temporal region; a dark spot commences between the eyes and covers the middle of the back. Vomerine teeth between choanæ. Western Australia, Tasmania, Victoria, and New South Wales.

H. adelaidensis.

47 mm. A slender species. Brown above, uniform or spotted or marbled with darker; dark streak from nostril through eye along each side of the body with white or pink streak underneath. Western and North Australia.

H. citropus.

58 mm. Purplish uniformly; blackish streak along canthus; another with light upper edge along side of body. Central district of New South Wales.

The Litorian Group.

H. aurea.

79 mm. Bright green to dark brown, with longitudinal bands or series of spots of golden yellow to pale yellow, always a golden to whitish dorso-lateral line. Tasmania and all Australia except the centre.

H. lesueurii.

65 mm. Olive or purplish, with more or less distinct darker markings; dark streak from tip of snout through eye to side; groin black marbled; back of thighs black and white spotted. Victoria, New South Wales, and Queensland.

H. nigrofrenata.

41 mm. Light olive; a broad black band on each side of the head through the eye, followed by a black spot; blackish band across back of wrist; sides of hind limbs with blackish line. Cape York.

H. affinis.

35 mm. Brown; loreal and temporal regions blackish; hinder side of thighs black and white marbled. North Australia and Queensland.

H. latòpalmata.

37 mm. Brownish or olive above with large insuliform, more or less confluent spots; blackish loreal-temporal streak; sides of thigh spotted with whitish. Western Australia, New South Wales, and Queensland.

H. freycineti.

Colours of preceding. Sydney district.

H. nasuta.

48 mm. Dark longitudinal bands on the back; black streaks on back of thighs. Northern rivers of New South Wales, Queensland, and North Australia.

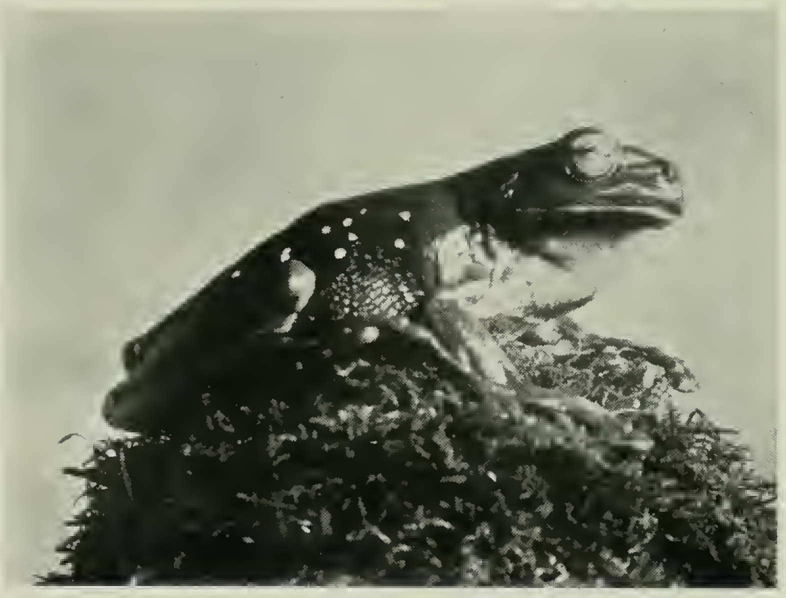
The Great Green Tree Frog.

H. caerulea.

Head broader than long; snout rounded truncate with a distinct canthus rostralis; tongue circular, very slightly notched behind; space between the orbits broader than the upper eyelid; tympanum very distinct, two-thirds diameter of eye. Fingers one-third webbed; toes nearly entirely webbed; discs of fingers at least as large as the tympanum, of toes rather smaller; the adpressed ankle joint hardly reaches the eye. Skin smooth above, much thickened and studded with large pores on the back of the head and scapular region, the granulated region limited outwards by a strong curved fold; belly and lower surfaces of limbs granulate. Male in breeding season with brown rugosities on inner side of the first finger; a vocal sac.

Colour: Most unfortunately named caerulea, as the upper surfaces are of a bright pea-green, the lower being white unspotted. In some individuals the sides of the body have white spots, in others these are wanting.

The largest of our Hylas, well adapted to free swimming in the pools and rivers, and also to climbing. It may frequently be seen sitting in numbers on the bushes or branches of small saplings overhanging or near the water.



From life. Hyla cærulea. *A. J. Hamilton.*

Spread over the warmer parts of the Continent, not in the colder parts of Victoria nor in Tasmania. Those of the plains and drier regions are smaller, those which enjoy a liberal supply of water grow larger, perhaps even to a length of 4 inches.

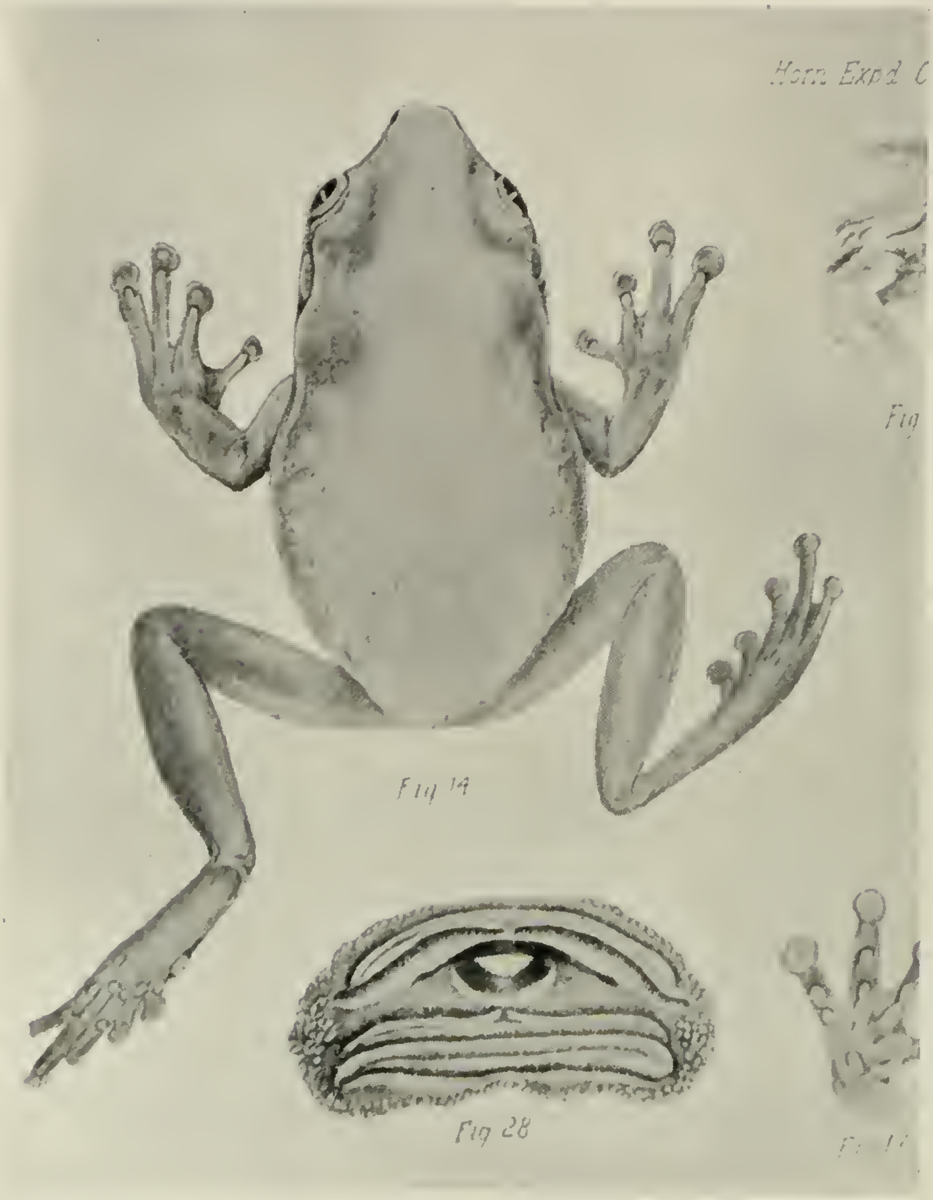
H. infrafrenata (Günther) from Cape York, and *H. gilleni* (Spencer) from the Northern Territory are smaller allied forms.

The Slender Tree Frog.

H. gracilenta.

"A species whose stronghold according to present knowledge is Queensland, and which find their southern limit somewhere about the northern boundary of New South Wales. It is a very beautiful frog when alive: the iris has an inner portion golden shading into a circumferential ring of bright coppery-red: the body above green or yellowish-green; in the males the throat, part of the upper arm, shoulders, a line along the flanks bright yellow; the under surface of the body and limbs tinged with yellow; the back of the thighs purplish."

Mr. Helms says: "This species may almost be called arboreal; most of the specimens were found on the leaves of the arrowroot plant; during the day time they sit quite still with their eyes closed, probably asleep. I kept some specimens alive for some time in a vivarium along with specimens of *H. caerulea*: individuals of both species during the day were invariably asleep, either perched on the leaves of an *Arum* or adhering to the sides of the vivarium—to glass or wood indifferently, springing from one side and adhering to the other instantly on reaching it." (Fletcher.)



Horn Exp.

Hyla gilleni.

The Common Brown Tree Frog.

H. ewingii.

A small frog under 2 inches long. Fingers free, flanged or fringed and with a small rudiment of a web. Toes, the third and fifth webbed to about the last joint; the others less webbed. (Fletcher).

Very variable in colour, from absolutely white, though silvery-grey to dark brown, in the best marked specimens with a characteristic dark spot commencing between the eyes and extending over the middle of the back. In some the inner side of the legs is of a bright orange. (*H. calliscelis.*)

Usually met with on the ground, or under logs or stones, but I have seen them seated on the leaves of small eucalypts in Victoria at the height of some feet from the ground.

It is spread over South-west Australia, South Australia, New South Wales, Victoria, and Tasmania.

The Green and Golden Bell Frog.

H. aurea.

Head semi-elliptical, longer than broad, flattened above in front, concave between the very prominent eyes, which are less than the diameter of the orbit apart; tympanum large, oval. Body broad, ovate, depressed. Legs stout, well developed, fingers nearly free, toes fully webbed; discs quite small. Front of head, cheeks and mid-line of the back smooth; about 4 irregular lines of large tubercles on the back; a thick tubercular ridge of a yellow colour separating the back from the side; sides and belly and under surfaces of limbs granulated. Colour: Brilliant pea green above and purplish below; longitudinal bands of golden yellow on the back. A black dorso-lateral line. Limbs green and yellow mottled above, the legs of a bluer green; hind part of thighs and legs rusty orange. (After McCoy.)

These are the typical colours of this frog in the active season, but it shows the most remarkable power of accommodating its colour to its surroundings. The same individual may be seen green in the marshes, and if captured will turn brown on the ground or floor, and return to its green dress on release in its old haunts. One that I had took refuge in among the coal, and promptly became black. This habit is of use in protecting the animal from the cranes and other birds and snakes which hunt the frogs when they are lively in the cool of the summer nights.

Occasionally this frog is seen sitting near the ground on bushes or broad-leaved plants, but it is typically a swamp and river frog, having admirable powers of swimming. On wet days and in the evenings it is very vocal, the Krek, Krek, Krek being sometimes deafening, while occasionally an old male, with well developed vocal sac gives out a sonorous Clunk, which can be heard for a long distance. I have watched them almost fringing the margin of a small pond in the breeding season, the males and females in union, the male with his vocal sacs distended to their utmost, and giving out huge Clunks of contentment. McCoy says that people seeking their horses or cows at dusk in the bush have had difficulty in distinguishing this musical note from the short clunk of the cattle bells.

From life.

Hyla aurea.

At night if the ground is wet with rain or dew, they wander over it seeking slugs, worms, insects, etc., while in the daytime they keep on the margins of pools or in the water, taking advantage of any opportunity to capture flies or mosquitoes. They are very useful animals in this way, and it is folly to wantonly destroy them. It is the frog most often seen, ranging all over Australia except the Centre and perhaps North-west Australia.

Genus Hylella.

H. bicolor.

Head as broad as long; snout sub-triangular with distinct canthus; space between the eyes broader than the upper eyelid; tongue sub-oval, slightly nicked; tympanum distinct about half as broad as the eye. Fingers webbed at base; toes nearly full webbed; discs smaller than the tympanum. Skin smooth; belly and lower surface of thighs granulate; a strong fold of the skin across the chest. Males with external vocal sac.

Colour: Bluish above, unspotted or dotted with blackish, a blackish streak on the canthus and temporal region; a white band from below the eye to the shoulder or further; beneath white without spots.

An elegant little frog, not often seen, from New South Wales to the West and North of Sydney.

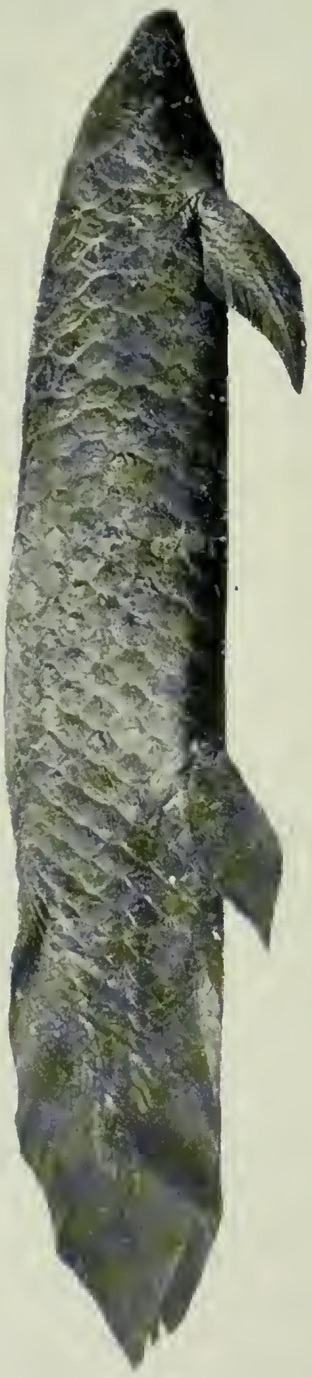
DIPNOI.

The Australian Lung-Fish.

Eu-ceratodus forsteri.

This remarkable animal, part fish, part amphibian, has an elongated body reaching to within an inch or two of three feet in length. It is laterally compressed, and covered over with large cycloid scales, which are thin and superficially calcified. The head is small and depressed, with an acute snout. The paired fins are long, acute and paddle-shaped, the ventrals being situated far back. The dorsal fin rises about the middle of the back, and like the anal, is continuous with the important caudal fin. The skeleton is partly osseous, partly cartilaginous, the notochord persisting throughout life. There is a pair of vomerine teeth, and a pair each of large 6 to 7 pronged teeth, borne by the palate and the mandible. There is a narrow gill opening on either side. The gills are free, but are not borne by all the bronchial arches.

Ceratodus is one of the very small group of fishes which breathe air direct. The swimming-bladder is converted into a large lung, which the animal uses regularly to reinforce the gills in respiration. Alone of its Order in Australia, its nearest allies are the Mud-Fishes of East and West tropical Africa, and the Amazons, *Protopterus* and *Lepidosiren*. The lung is wide and symmetrical, and extends from one end of the abdominal cavity to the other, being firmly attached along each side of the aorta. Externally it presents small rounded protuberances, which correspond to the minor cells of the cavity, and is surrounded by a network of vessels from the pulmonary vessels. It opens by a very short duct, which terminates in a glottis, into the ventral surface of the œsophagus, rather to one side. The glottis is a slit one-eighth of an inch long, and a folding of the membrane acts as a valve. Internally the lung is divided into compartments



Austr. Mus.

Lung Fish—Ceratodus.

by strong transverse septa, about 30 on each side, and the bottom of each compartment is subdivided into cells by a network of thin partitions. The blood vessels, while in the main resembling in arrangement those of the Sharks, show in association with the presence of a lung some marked resemblances to those of the Amphibia, and especially of the tadpole of the Frog during the stage in which both the gills and the lungs are used in respiration. In fact, so far as respiration is concerned, *Ceratodus* is practically a gigantic tadpole.

Ceratodus is now confined to the Mary and Burnett Rivers of Queensland. It never leaves the water voluntarily. In fact, if removed from the water, it remains passive, and dies in a few hours. It can, however, if kept moist in wet water-weed or moss, live for a long time, and bears transportation over considerable distances. Mr. D. O'Connor has been very successful in conveying the fish in this way, which serves well for transport in Australia. On one occasion the fish were out of water for 33 hours and suffered no harm. He was also successful in carrying specimens to London, where they arrived in a healthy state at the end of their long journey. In this case he used a tank, and fed the animals on water-weed, especially Valisneria. It is hardy and has been acclimatised in Brisbane, while fish which reached London lived for several years in the Zoological Gardens. It is in general sluggish, "too lazy to get out of the way when about to be handled," and "resting for hours on the bottom." It will feed both by night and by day, but seems to be more active at night.

Information on the habits of *Ceratodus* has been collected by several observers, Ramsay, Illidge, Spencer, Semon, and O'Connor, and an excellent summary of these has been given in the Proceedings of the Zoological Society of London by Dr. Bashford Green. He adds most valuable records of his observations made on the animals during captivity in the tanks of the Zoological Gardens.

He writes that the aquatic respiration (by gills) is slow and regular. The opercular cavity fills and empties twelve times a minute ordinarily, but more rapidly if the animal is excited. The mouth is scarcely opened, the water being drawn through the dilated nostrils. At intervals of 40 to 60 minutes the fish shows uneasiness in the water, gasps several times, then rises to the surface, exhales and draws in a mouthful of air somewhat spasmodically. The fishermen of the district where the fish lives call this action "spouting." The noise so produced is a kind of grunt. The creature may make several such gulps of air, then closes its mouth, and sinks to the bottom, bubbles passing out on either side of the head as the fish sinks. In sinking, the fins are extended at the sides and act like parachutes. At night, or if the fish is alarmed, the respirations are more frequent. While the animal makes use of the lung for aerial respiration whatever be the state of the water, coming to the surface at regular intervals, Spencer, who spent three months on the Burnett, suggests that there are two special times when the possession of the lung is most valuable to it. These are when the river is in flood and washes down enormous quantities of sand, and when the river is abnormally low in the hot season, and the water becomes foul from decomposition of the numerous river weeds. The adult *Ceratodus* does not, so far as is known, æstivate in the mud of the dried up waterholes, but quite recently Mr. H. Wilson, of Coranga Station, on the Burnett, forwarded to Mr. O'Connor specimens of young fish, about 14 inches in length, which he had found buried in the mud of the river, which was unusually low at the time. Thus the young *Ceratodus* is preserved alive during the drought in the same manner as are some of our Frogs.

Ceratodus swims leisurely about the aquarium, says Dr. Green, undulating the body and balancing with its pectoral fins. When alarmed it propels itself forward by strong strokes of the tail, the paired fins being tightly folded against the body. It will rest sometimes for several minutes in a pose which strongly recalls that of a Salamander. It lifts its head from the bottom raising itself upon the edges of its pectoral fins, and will turn its head in quite the manner of an Amphibian. It can also push itself backward, and very occasionally will use its pectorals alternately. In all these peculiarities of action it is unlike other fish, and resembles the Amphibia.

In captivity *Ceratodus* was capable of thriving on an animal or a vegetable diet, and probably in nature it takes that which comes handiest. Like Amphibians it snaps at its food. By day especially it seems to be slow of vision, and rather to "feel" than to see the presence of its food, and in taking a morsel often curiously blunders over the act.

There is a certain amount of variation in the colouring, which Dr. Green thinks is perhaps associated with sex distinctions. One form, perhaps the female, is greyish on the back and sides, paler underneath. Another, perhaps the male, is darkish bottle-green, the surface shining with a velvety bloom like that of the Salamander. The fins are darker, and the head darker and greener. The eye is dull, the iris of a brown colour.

Dental plates apparently identical with those of the living *Ceratodus* were obtained by Krefft from alluvial beds in the Darling Downs. Thus the former distribution of the species was more extended. The genus, or one nearly identical, was represented in Triassic, Jurassic and probably Cretaceous times by several species found fossil in Britain, Germany, South Africa, India, and North America. Fossil remains of an allied genus, *Gosfordia*, in which the scales are very small and delicate and are finely striated, have been found in Hawkesbury beds in New South Wales.

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    (*a*) Sub-Order Fissipedia.
      F. Canidæ, 8.
        Canis Dingo (Warrigal or Dingo).

    (*b*) Sub-Order Pinnipedia.
      F. Otariidæ: 14.
        Zalophus lobatus (Australian Sea Lion).
        Arctocephalus forsteri (Australian Sea Bear).

      F. Phocidæ: 19.
        Ogmorhinus leptonyx (Sea Leopard).

  2. O. Rodentia: 21.
      F. Muridæ: 22.
        Hydromys chrysogaster (The Water Rat).
        Zeromys myoides (Thomas's Rat).
        Mus fuscipes (Dusky-footed Rat).
          ,, assimilis (Allied Rat).
          ,, sordidus (Sordid Rat).
          ,, terrae-reginae (Gray's White-footed Rat).
          ,, gouldi (Gould's Rat).
          ,, greyi (Grey's Rat).
          ,, nanus (Little Rat).
          ,, albocinereus (Greyish-white Mouse).
          ,, delicatulus (Pigmy Mouse).
        Conilurus albipes (White-footed Jerboa Rat).
          ,, conditor (Nest-building Jerboa Rat).
          ,, longicaudatus (Long-tailed Jerboa Rat).
          ,, cervinus (Fawn-coloured Jerboa Rat).
        Mastacomys fuscus (Tasmanian or Dusky Broad-toothed Rat).
        Uromys macropus (Giant Rat).
          ,, cervinipes (Buff-footed Rat).

3. O. Chiroptera: 36.
   - (*a*) Sub-Order Megachiroptera.
     - F. Pteropodidæ: 36.
       - Pteropus poliocephalus (Grey-headed Flying Fox).
       - ,, brunneus (Dusky Flying Fox).
       - ,, gouldi (Gould's Flying Fox).
       - ,, conspicillatus (Spectacled Flying Fox).
       - ,, scapulatus (Collared Flying Fox).
       - Uronycteris cephalotes (Pallas' Fruit Bat).
       - Macroglossus australis (Little Fruit Bat).
   - (*b*) Sub-Order Microchiroptera.
     - F. Rhinolophidae: 41.
       - Rhinolophus megaphyllus (Greater Horseshoe Bat).
       - Rhinonycteris aurantia (Orange Horseshoe Bat).
       - Hipposiderus cervinus (Fawn-coloured Horseshoe Bat).
       - ,, bicolor var. aruensis (Brown Horseshoe Bat).
     - F. Nycteridæ: 42.
       - Megaderma gigas (Great Blood-sucking Bat).
     - F. Vespertilionidæ: 43.
       - Nyctophilus timoriensis (Australian Long-eared Bat).
       - ,, walkeri (Walker's Bat).
       - Vesperugo pumilus (Little Bat).
       - ,, abramus (Yellow-headed Bat).
       - ,, kreffti (Krefft's Bat).
       - Chalinolobus morio (Chocolate Bat).
       - ,, signifer (Dobson's Bat).
       - ,, goldi (Gould's Bat).
       - ,, nigro-griseus (Pied Bat).
       - Scotophilus rueppelli (Rüppell's Bat).
       - ,, greyi (Grey's Bat).
       - Vespertilio adversus (Great-footed Bat).
       - ,, australis (Small-footed Bat).
       - Kerivoula papuensis (Eastern Forest Bat).
       - Miniopterus schreibersi (Schreibers' Bat).
       - ,, australis (Tomes' Bat).
     - F. Emballonuridæ: 48.
       - Taphozous flaviventris (Sharp-nosed Bat).
       - ,, affinis (Leche's Bat).
       - Nyctonomus plicatus (Plicated Bat).
       - ,, australis (White-striped Bat).
       - ,, norfolcensis (Norfolk Island Bat).

4. O. Cetacea: 50.

F. Balænidæ: 51.
Balæna australis (Southern Right Whale).
Neobalæna marginata (Pigmy Right Whale).
Megaptera boops (Hump-back Whale).
Balænoptera huttoni (Sulphur-bottom Whale).

F. Physeteridæ: 54.
Physeter macrocephalus (Sperm Whale or Cachalot).
Kogia breviceps (Short-headed Sperm Whale).
Hyperoodon planifrons (Southern Bottle-nose Whale).
Mesoplodon layardi (Long-toothed Whale).
,, densirostris (Massive-toothed Whale).
,, grayi (Small-toothed Whale).

F. Delphinidæ: 56
Delphinapterus leucas (Beluga or White Whale).
Orca gladiator (Killer Whale).
Pseudorca crassidens (Tasmanian Killer).
Globicephalus melas (Pilot Whale).
Delphinus delphis (Dolphin).
Tursiops catalania (Southern Dolphin).
Sotalia gadamu.

5. O. Sirenia: 60.
Halicore dugong (Dugong).

SUB-CLASS METATHERIA:

(*a*) Sub-Order Diprotodontia.

F. Macropodidæ: 63.

(1) Sub-family Hypsiprymnodontinæ:
Hypsiprymnodon moschatus (Australian Musk Rat).

(2) Sub-family Potoroinæ:
Potorous tridactylus (Common Rat-Kangaroo).
,, gilberti
,, platyops.
Caloprymnus campestris (Plain Rat-Kangaroo).
Bettongia penicillata (Brush-tailed Bettong).
,, cuniculus (Tasmanian Bettong).
,, lesuenrii (Lesueur's Bettong).
,, gaimardi (Gaimard's Bettong).
Æpyprymnus rufescens (Rufous Rat-Kangaroo).

(3) Sub-family Macropodinæ:

Lagostrophus fasciatus (Banded Hare-Wallaby).
Dendrolagus lumholtzi (Lumholtz' Tree Kangaroo).
,, bennettianus (Bennett's Tree Kangaroo).
Lagorchestes hirsutus (Rufous Hare-Wallaby).
,, leporoides (Common Hare-Wallaby).
,, conspicillatus (Spectacled Hare-Wallaby).
,, leichhardti.
Onychogale lunata (Crescent Wallaby).
,, frenata (Bridled Wallaby).
,, unguifera (Nail-tailed Wallaby).
Petrogale concinna (Little Rock Wallaby).
,, inornata (Plain-coloured Rock Wallaby).
,, brachyotis (Short-eared Rock Wallaby).
,, lateralis (West Australian Rock Wallaby).
,, penicillata (Brush-tailed Rock Wallaby).
,, xanthopus (Yellow-footed Rock Wallaby).
Macropus brachyurus (Short-tailed Wallaby).
,, billardieri (Rufous-bellied Wallaby).
,, thetidis (Pademelon).
,, eugenii
,, parma (White-throated Wallaby).
,, stigmaticus (Branded Wallaby).
,, wilcoxi (Red-legged Wallaby).
,, coxeni (Cape York Wallaby).
,, agilis (Agile Wallaby).
,, ualabatus (Black-tailed Wallaby).
,, ruficollis (Red-necked Wallaby).
,, dorsalis (Black-striped Wallaby).
,, greyi (Grey's Wallaby).
,, irma (Black-gloved Wallaby).
,, parryi (Parry's Wallaby).
,, magnus (Owen's Kangaroo).
,, isabellinus.
,, rufus (Great Red Kangaroo).
,, robustus (Wallaroo or Euro).
,, antilopinus.
,, giganteus (Common or Great Grey Kangaroo).

F. Phalangeridæ: 90.

(1) Sub-family Phascolarctinæ:

Phascolarctus cinereus (Koala or Native Bear).

(2) Sub-family Phalangerinæ:
Phalanger maculatus (Spotted Cuscus).
Trichosurus caninus (Short-eared Opossum).
,, vulpecula (Common Opossum).
Pseudochirus archeri (Archer's Ring-tailed Opossum).
,, cooki (Tasmanian Ring-tailed Opossum).
,, occidentalis (Western Ring-tailed Opossum).
,, peregrinus (Common Ring-tailed Opossum).
,, herbertensis (Herbert R. Ring-tailed Opossum).
,, lemuroides (Sombre Ring-tailed Opossum).
Petauroides volans (Greater Flying-Opossum).
Dactylopsila trivirgata (Striped Opossum).
Petaurus australis (Yellow-bellied Flying-Opossum).
,, sciureus (Squirrel-like Flying-Opossum).
,, breviceps (Lesser Flying-Opossum).
Gymnobelideus leadbeateri (Leadbeater's Opossum).
Dromicia nana (Dormouse-Opossum).
,, concinna (Western Dormouse-Opossum).
,, lepida (Lesser Dormouse-Opossum).
Acrobates pygmæus.

(3) Sub-family Tarsipedinæ:
Tarsipes rostratus (Long-snouted Pouched Mouse).

F. Phascolomyidæ: 110.
Phascolomys mitchelli (Common Australian Wombat).
,, ursinus (Tasmanian Wombat).
,, latifrons (Hairy-nosed Wombat).

(*b*) Sub-order Polyprotodontia:
F. Notoryctidæ: 113.
Notoryctes typhlops (Marsupial Mole).

F. Dasyuridæ: 117.
(1) Sub-family Myrmecobiinæ:
Myrmecobius fasciatus (Banded Ant-eater).

(2) Sub-family Dasyurinæ:
Antechinomys laniger (Jerboa Pouched Mouse).
Sminthopsis crassicaudata.
,, larapinta
,, psammophila.
,, virginiæ.
,, murina.
,, leucopus.

Phascologale cristicaudata (Krefft's Pouched Mouse).
,, macdonnellensis (Fat-tailed Pouched Mouse).
,, calura (Lesser Brush-tailed Pouched Mouse).
,, penicillata (Greater Brush-tailed Pouched Mouse).
,, minutissima (Pigmy Pouched Mouse).
,, flavipes (Yellow-footed Pouched Mouse).
,, minima (Little Pouched Mouse).
,, swainsoni (Swainson's Pouched Mouse).
,, apicalis (Freckled Pouched Mouse).
Dasyuroides byrnei (Byrne's Pouched Mouse).
Dasyurus hallucatus (North Australian Native Cat).
,, geoffroyi (Geoffroy's Native Cat).
,, viverrinus (Common Native Cat).
,, gracilis (Slender Native Cat).
,, maculatus (Great Spotted-tailed Native Cat).
Sarcophilus ursinus (Tasmanian Devil).
Thylacinus cynocephalus (Tasmanian or Marsupial Wolf).

F. Peramelidæ: 133.
Chœropus castanotis (Pig-footed Bandicoot).
Perameles bougainvillii (Western Striped Bandicoot).
,, gunni (Tasmanian Striped Bandicoot).
,, nasuta (Long-nosed Bandicoot).
,, macrura (North Australian Bandicoot).
,, aurata (Golden Bandicoot).
,, obesula (Short-nosed Bandicoot).
Peragale leucura (White-tailed Rabbit Bandicoot).
,, lagotis (Common Rabbit Bandicoot).

SUB-CLASS PROTOTHERIA:

Ornithorhynchus anatinus (Platypus).
Echidna aculeata (Echidna or Native Porcupine).
,, ,, var. typica
,, ,, ,, lawesii.
,, ,, ,, setosa.
Pro-echidna.

II. REPTILIA: 150.

1. O. Ophidia: 150.

F. Typhlopidæ: 162.
Typhlops polygrammicus.
,, australis.
,, bituberculatus.

F. Boidæ: 164.

Lialis childreni.
,, fuscus.
,, olivaeus.
Python variegatus (Carpet Snake).
,, ,, var. spilotes (Diamond Snake).
,, amethystinus.
Aspidites melanocephalus (Black-headed Python).
,, ramsayi (Ramsay's Python).

F. Colubrinæ: 170.

(1) Sec. Aglypha:

Tropidonotus picturatus (Fresh-water Snake).
Stegnotus cucullatus (Hooded Snake).
,, plumbeus (Leaden Snake).
Dendrophis calligaster (Northern Green Tree Snake).
,, punctulatus (Common Green Tree Snake).

(2) Sec. Opisthoglypha:

Hypsirhina macleayi (Macleay's Water Snake).
Cerberus australis (Australian Rockadam.)
Myron richardsoni (Richardson's Water Snake).
Fordonia leucobalia (White-bellied Water Snake).
Dipsadomorphus fuscus (Brown Tree Snake).

(3) Sec. Proteroglypha:

(*a*) Div. Elapinæ:

Pseudelaps squamulosus (Red-bellied Snake).
,, diadema (Red-naped Snake).
Diemenia psammophis (Grey Whip Snake).
,, textilis (Brown Snake).
Pseudechis porphyriacus (Black Snake).
Denisonia superba (Copper-headed Snake).
,, coronoides (White-lipped Snake).
,, flagellum (Little Whip Snake).
,, signata (Black-bellied Snake).
,, pallidiceps (Northern Pale-headed Snake).
Hoplocephalus bungaroides (Broad-headed Snake).
,, stephensii (Stephens' Banded Snake).
Tropidechis carinatus (Clarence River Snake).
Notechis scutatus (Tiger Snake).
Acanthophis antarctica (Death Adder).
Furina bimaculata (Verreaux's Snake).
,, occipitalis (Black and White Ringed Snake).

(*b*) Div. Hydrophinæ:

Hydrus platurus (Yellow-bellied Sea Snake).
Hydrelaps darwiniensis (Port Darwin Sea Snake).
Hydrophis kingii (King's Long-necked Sea Snake).
,, elegans (Elegant Long-necked Sea Snake).
Distira stokesii.
,, major.
,, ornata.
,, grandis.
Aipysurus laevis (Brown Sea Snake).
,, australis.
Platurus colubrinus.
,, laticaudatus.

2. O. Emydosauria: 188.

F. Crocodilidæ: 189.
Crocodilus johnstonii (Johnston's Crocodile).
,, porosus (Salt-water Crocodile).

3. O. Chelonia: 193.

F. Sphargidæ: 194.
Dermochelys coriacea (Luth).

F. Chelonidæ: 195.
Chelone mydas (Green Turtle).
Natator tessellatus.
Thalassochelys caretta (Logger-head Turtle).

F. Chelydidæ: 198.
Chelodina longicollis (Long-necked Tortoise).
,, expansa (Lagoon Tortoise).
,, oblonga (Oblong Tortoise).
Emydura macquariæ (Murray Tortoise).
,, krefftii (Krefft's Tortoise).
,, australis (Small Tortoise).
,, latisternum (Broad-bellied Tortoise).
Elseya dentata (Northern Tortoise).

4. O. Lacertilia: 203.

F. Geckonidæ: 203.
Nephrurus asper.
,, laevis.
Rhynchœdura ornata.
Ceramodactylus damaeus.

F. Geckonidæ—*continued.*
  Gymnodactylus pelagicus.
  ,, miliusii.
  ,, sphyrurus.
  ,, phyllurus.
  ,, cornutus.
  Heteronota bynoei.
  Phyllodactylus marmoratus.
  ,, macrodactylus.
  ,, guentheri.
  ,, ocellatus.
  Ebenavia horni.
  Diplodactylus ciliaris.
  ,, spinigerus.
  ,, strophurus.
  ,, intermedius.
  ,, byrnei.
  ,, vittatus.
  ,, polyopththalmus.
  ,, steindachneri.
  ,, pulcher.
  ,, tesselatus.
  ,, conspicillatus
  Œdura marmorata.
  ,, tryoni.
  ,, robusta.
  ,, lesueurii.
  ,, rhombifera.
  Gehyra variegata.
  ,, australis.
  Perochirus mestoni.
  Lepidodactylus pusillus.
  Hoplodactylus tuberculatus.

F. Pygopodidae: 215.
  Pygopus lepidopus (Common Slow-Worm).
  Cryptodelma nigriceps (Black-headed Slow-Worm).
  ,, orientalis (Eastern Slow-Worm).
  Delma fraseri (Fraser's Slow-Worm).
  ,, tincta.
  ,, plebeia.
  ,, impar (Striped Slow-Worm).
  Pletholax gracilis.
  Aprasia pulchella (Little Slow-Worm).
  Ophidiocephalus taeniatus (Desert Slow-Worm),
  Lialis burtonii (Burton's Slow-Worm).

F. Agamidæ: 221.
Gonyocephalus spinipes (Spiny-footed Crested Dragon).
,, godeffroyi (Great Crested Dragon).
,, boydii (Blue-cheeked Crested Dragon).
Chelosania brunnea (Swelled-head Dragon).
Amphibolurus maculatus (Military Dragon).
,, imbricatus (Peters' Dragon).
,, ornatus (Ornate Dragon).
,, rufescens (Rusty Dragon).
,, cristatus (Low-crested Dragon).
,, scutulatus (Lozenge-spotted Dragon).
,, caudicinctus (Ring-tailed Dragon).
,, decresii (Tawny Dragon).
,, pictus (Painted Dragon).
,, reticulatus (Netted Dragon).
,, inermis (Smooth-backed Dragon).
,, adelaidensis (Queen Adelaide's Dragon).
,, pulcherrimus (Little Spotted Dragon).
,, angulifer (Mountain Dragon).
,, muricatus (Common Dragon).
,, barbatus (Bearded Dragon or Jew Lizard).
Tympanocryptis lineata (White-streaked Earless Dragon).
,, cephalus (Brown Earless Dragon).
Diporophora bilineata (Gray's Dragon).
,, winneckei (Blue-backed Dragon).
,, australis (Steindachner's Dragon).
,, bennettii (Bennett's Dragon).
Physignathus gilberti (Gilbert's Water Dragon).
,, longirostris.
,, temporalis.
,, lesueurii (Eastern Water Dragon).
Chlamydosaurus kingii (Frilled Dragon or Frilled Lizard).
Moloch horridus.

F. Varanidæ: 236.
Varanus salvator.
,, indicus.
,, varius (Lace Monitor or Iguana).
,, giganteus.
,, gouldii (Gould's Monitor).
,, punctatus.
,, timorensis.
,, acanthurus.
,, caudolineatus.
,, gilleni.
,, eremius.

F. Scincidæ: 240.

Egernia stokesii.
  ,, depressa.
  ,, whitii.
  ,, major.
  ,, kingii.
  ,, cunninghamii.
Trachysaurus rugosus (Shingle-back or Stump-tailed Lizard).
Tiliqua scincoides (Blue-tongued Lizard).
  ,, adelaidensis.
  ,, nigrolutea.
  ,, occipitalis.
  ,, longicauda.
Hemisphaeriodon gerrardii.
Lygosoma:

(*a*) Sub-genus Hinulia.
Hinulia lesueurii.
  ,, taeniolata.
  ,, quoyi.
  ,, tenuis.
  ,, richardsoni.
  ,, fasciolatum.
  ,, monotropis.

(*b*) Sub-genus Liolepisma.
Liolepisma mustelinum.
  ,, entrecasteauxii.
  ,, trilineatum.
  ,, pretiosum.
  ,, ocellatum.
  ,, challengeri.
  ,, fuscum.
  ,, peronii.
  ,, rhomboidale.
  ,, metallicum.
  ,, tetradactylum.

(*c*) Sub-genus Emoa.
Emoa spenceri.

(*d*) Sub-genus Riopa.
Riopa albofasciolatum.
  ,, rufescens.

(*e*) Sub-genus Homolepida.
Homolepida casuarinæ.

F. Scincidæ—*continued.*

Lygosoma—*continued.*

(*f*) Sub-genus Hemiergis.
- Hemiergis peronii.
  - ,, decresiensis.
  - ,, didactylis.

(*g*) Sub-genus Siaphos.
- Siaphos æqualis.

(*h*) Sub-genus Rhodona.
- Rhodona microtis.
  - ,, bougainvillii.
  - ,, fragilis.
  - ,, gerrardii.
  - ,, miopus.
  - ,, bipes.

(*i*) Sub-genus Lygosoma (restricted).
- Lygosoma reticulatum.
  - ,, verreauxii.
  - ,, truncatum.
  - ,, ophioscincus.
- Ablepharus boutoni.
  - ,, lineo-ocellatus.
- Tropidophorus queenslandiæ.

III. AMPHIBIA: 259.

F. Ranidæ: 265.
- Rana papua.

F. Cystignathidæ: 266.
- Mixophyes fasciolatus (Great Barred River Frog).
- Limnodynastes peronii.
  - ,, salminii.
  - ,, tasmaniensis.
  - ,, dorsalis.
  - ,, platycephalus.
  - ,, ornatus.
- Phanerotis fletcheri.
- Cryptotis brevis.
- Crinia signifera (Brown Froglet).
  - ,, georgiana (Georgian Frog).
  - ,, tasmaniensis.
  - ,, laevis (Smooth Froglet).

F. Cystignathidæ—*continued*
- Crinia froggatti.
- ,, haswelli.
- ,, victoriana.
- Hyperolia marmorata.
- Chiroleptes platycephalus.
- ,, brevipalmatus.
- ,, brevipes.
- ,, australis.
- ,, alboguttatus.
- ,, inermis.
- Helioporus albo-punctatus (Great Western Burrowing Frog).
- ,, pictus (Green Burrowing Frog).
- Philocryphus flavoguttatus (Great Eastern Burrowing Frog).
- Philoria frosti.

F. Bufonidæ: 284.
- Pseudophryne australis (Yellow-crowned Toadlet).
- ,, dendyi (Dendy's Toadlet).
- ,, bibronii (Bibron's Toadlet).
- ,, semi-marmorata.
- ,, coriacea.
- ,, guentheri (Burrowing Toadlet).
- Notaden bennetti (Cross-bearing Toad).
- Myobatrachus gouldii (Small-headed Toad).

F. Hylidæ: 288.

(*a*) Green Tree Frogs:
- Hyla phyllochroa.
- ,, gracilenta (Slender Tree Frog).
- ,, caerulea (Great Green Tree Frog).
- ,, infrafrenata.
- ,, gilleni.

(*b*) Brown Tree Frogs:
- Hyla peronii.
- ,, rubella.
- ,, dentata.
- ,, maculata.
- ,, ewingii (Common Brown Tree Frog).
- ,, calliscelis.
- ,, adelaidensis.
- ,, citropus.

F. Hylidæ—*continued.*

(*c*) Litorian Group:

Hyla aurea (Green and Golden Bell Frog).
 „ lesueurii.
 „ nigrofrenata.
 „ affinis.
 „ latopalmata.
 „ freycineti.
 „ nasuta.
Hylella bicolor.

IV. DIPNOI: 298.

Eu-ceratodus forsteri (Australian Lung-Fish).

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